PB83-168633

Thirty-Day Field Test of a Refinery Process Heater Equipped with Low-NOx Burners

KVB, Inc.
Irvine, CA

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Feb 83

U.S. Department of Commerce
National Technical Information Service
NTIS

PB83-168633

EPA-600/7-83-010
February 1983

THIRTY-DAY FIELD TEST OF A REFINERY PROCESS HEATER EQUIPPED WITH LOW-NO_x BURNERS

by

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Prepared for:

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA-600/7-83-010

2.

3. RECIPIENT'S ACCESSION NO.
PB83 168633

4. TITLE AND SUBTITLE
Thirty-day Field Test of a Refinery Process Heater Equipped with Low-NOx Burners

5. REPORT DATE
February 1983

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
W.A. Carter and R.J. Tidona

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
KVB, Inc.
18006 Skypark Boulevard
Irvine, California 92714

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.
68-02-2645

12. SPONSORING AGENCY NAME AND ADDRESS
EPA, Office of Research and Development
Industrial Environmental Research Laboratory
Research Triangle Park, NC 27711

13. TYPE OF REPORT AND PERIOD COVERED
Task Final; 7/81-1/82

14. SPONSORING AGENCY CODE
EPA/600/13

15. SUPPLEMENTARY NOTES IERL-RTP project officer is Robert E. Hall, Mail Drop 65, 919/541-2477.

16. ABSTRACT The report gives results of a continuous-monitor test to evaluate the long-term emissions from a gas-fired petroleum heater equipped with low-NOx burners. The test objective was to provide gaseous emissions data from a 62.9 cu m/hr (9500 bbl/d) natural-draft process heater for a 30-day period. The gaseous emissions measured were NO, CO, O2, and CO2. The data were analyzed to determine statistical distribution and statistical parameters. NO emissions data were found to be log-normally distributed, and the mean value was 44 ng/J (0.10 lb/million Btu) with a geometric dispersion of 1.07. Average stack concentration was 5.8 percent by volume, dry. Daily average CO emissions were generally below 225 ppm, dry, at 3 percent O2, and never exceeded 90 ppm.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group	
Pollution	Industrial Processes	Pollution Control	13B	13H
Natural Gas	Nitrogen Oxide (NO)	Stationary Sources	21D	
Heating Equipment	Carbon Monoxide	Low-NOx Burners	13A	
Nitrogen Oxides	Oxygen		07B	
Refineries	Carbon Dioxide		13I	
Field Tests			14B	

18. DISTRIBUTION STATEMENT
Release to Public

19. SECURITY CLASS *(This Report)*
Unclassified

20. SECURITY CLASS *(This page)*
Unclassified

21. NO. OF PAGES

22. PRICE

EPA Form 2220-1 (9-73)

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ABSTRACT

This is a final report on a continuous monitor test to evaluate the long-term emissions from a gas-fired petroleum heater equipped with low-NO_x burners. The objective of this test was to provide gaseous emissions data from a 62.9 m^3/h (9,500 barrel per day) natural draft process heater for a 30-day period. The gaseous emissions measured were NO, CO, O_2 and CO_2. An analysis of the data was conducted to determine the statistical distribution and statistical parameters. The NO emissions data were found to be log-normally distributed and the mean value was 44 ng/J (0.10 lb/10^6 Btu) with a geometric dispersion of 1.07. The average stack O_2 concentration was 5.8 percent by volume, dry basis. Daily average CO emissions were generally below 25 ppm, dry at 3 percent O_2, and never exceeded 90 ppm.

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SECTION 1.0

SUMMARY

1.1 OBJECTIVE AND SCOPE

The objective of this field test was to measure gaseous emissions from a gas-fired petroleum process heater for 30 days. In addition, heater operation was monitored and operational data were recorded.

The program scope calls for 30-day field tests to be conducted on process heaters equipped with low-NO_x burners for gaseous fuel and No. 2 and No 6 fuel/oils. This is the final report on the gas-fired process heater equipped with low-NO_x burners.

This report documents test equipment, presents a description of the heater, summarizes the data recorded and presents an analysis of the emissions data. Included as appendices are continuous monitor certification data and 15-minute average emission data.

1.2 RESULTS

The process heater at which this field test was conducted was similar to one which had been previously tested by KVB under a task to conduct baseline tests of process heaters equipped with low-NO_x burners*. It was not possible to conduct the 30-day test on the heater tested previously (Site 1 in EPA-600/7-81-169) because it was out of service for several months to undergo a major rework. The period of this 30-day test was from July 31, 1981 through September 20, 1981.

The procedure and results of the 30-day test are discussed in detail in Section 3.0. A summary of the 24-hour average gaseous emissions is presented in Table 1-1. This table was compiled from 15-minute averages recorded

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*Tidona, R. J. et al., "Emissions from Refinery Process Heaters Equipped with Low-NO_x Burners," October 1981. EPA-600/7-81-169.

TABLE 1-1. SUMMARY OF DAILY AVERAGE GASEOUS EMISSIONS - PROCESS HEATER

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

24 HOUR DATA

DRY STACK GAS CONCENTRATION

DATE	LOAD bbl/day*	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J
7/31/81	7920.0	3.1	10.2	11	79	11	79	3	43
8/ 1/81	7920.0	3.8	9.5	7	80	7	83	2	45
8/ 2/81	7920.0	4.0	9.3	8	79	8	83	2	45
8/ 3/81	7920.0	4.7	9.1	7	77	7	85	2	46
8/ 4/81	7755.0	3.5	9.5	7	80	7	82	2	44
8/ 5/81	8580.0	3.8	9.4	8	81	8	84	2	46
8/ 6/81	8580.0	4.0	9.2	6	80	6	84	2	45
8/ 7/81	8580.0	3.3	10.0	6	79	6	80	2	43
8/ 8/81	8580.0	4.2	9.3	5	78	5	83	1	45
8/21/81	6550.0	10.6	5.1	48	41	83	71	27	38
8/22/81	6550.0	7.8	7.1	6	60	8	82	2	44
8/23/81	6700.0	6.3	7.9	6	68	7	83	2	45
8/24/81	7150.0	7.1	7.5	8	69	10	89	3	48
8/25/81	7150.0	7.1	8.0	11	69	14	89	4	48
8/26/81	6811.8	6.6	8.1	5	71	6	88	2	48
8/27/81	6524.8	6.7	8.1	5	69	6	86	2	47
8/28/81	7531.5	6.9	7.9	7	68	8	87	2	47
8/29/81	8638.2	5.4	8.9	6	71	6	82	2	44
8/30/81	8290.0	4.2	9.6	22	72	23	77	7	41
8/31/81	8290.0	4.5	9.3	13	72	14	78	4	42
9/ 1/81	8425.5	5.2	8.7	7	69	7	78	2	42
9/ 2/81	8500.0	4.7	9.6	49	84	53	92	17	50
9/ 3/81	7546.8	5.3	10.4	6	78	6	89	2	48
9/10/81	6990.5	5.8	9.0	18	68	21	80	7	43
9/11/81	7000.0	7.5	7.9	21	62	28	82	9	44
9/12/81	7000.0	8.5	7.3	30	51	43	73	14	39
9/14/81	7000.0	7.4	7.9	12	64	15	84	5	46
9/15/81	7000.0	6.2	8.8	15	69	18	84	6	45
9/16/81	7000.0	5.8	9.0	16	74	19	87	6	47
9/17/81	6892.3	6.3	8.8	15	73	18	89	6	48
9/18/81	6849.5	6.9	7.7	12	68	15	87	5	47
9/19/81	6935.3	6.7	8.6	16	71	20	89	6	48
9/20/81	7000.0	6.4	8.7	17	69	20	85	6	46

* barrels/day

on an automatic data logger. A statistical analysis of the data was performed to determine the distribution of the data. It was determined that the data are best represented by a log-normal distribution. Based on this analysis, the mean NO value was 44 ng/J (0.1 lb/10^6 Btu) with a geometric dispersion of 1.07.

1.3 CONCLUSIONS

Based on analyses of the data gathered during this extended duration test, the following conclusions can be made:

1. Retrofitting a process heater with low-NO_x burners can be an effective NO_x control technology. The heater maintained the low-NO_x mode for more than 30-days with a mean NO value of 44 ng/J (0.1 lb/10^6 Btu) with the heater load fluctuating from 6411 bbl/day to 8638 bbl/day.

2. Heater operation with the low-NO_x burners presented no reliability or functional problems during the 30-day test.

3. The continuous monitor system using an extractive sampling system provided accurate, reliable data for the entire 30-day test period. The monitor system provided data 92 percent of the time the heater was on the line.

SECTION 2.0

INSTRUMENTATION AND PROCEDURES

This section presents a description of the instrumentation used to measure the gaseous emissions, the test procedures, the techniques for certifying the continuous monitor, and the heater tested.

2.1 EMISSIONS MEASUREMENT INSTRUMENTATION

The emissions measurements were made using a continuous monitor fabricated by KVB. The analytical instrumentation and sample handling equipment are contained in a temperature controlled cabinet 1.2 m wide x 0.76 m deep x 1.83 m high (48"W x 30"D x 72"H). Gaseous emission measurements were made with the analytical instruments listed in Table 2-1.

The continuous monitor was equipped with an automatic calibration system, which performed the function of zeroing and spanning the analyzers at 8-hour intervals.

TABLE 2-1. ANALYTICAL INSTRUMENTATION

Emission Species	Manufacturer	Measurement Method	Model No.
Nitrogen Oxides	Thermo Electron	Chemiluminescent	10 AR
Oxygen	Thermox	Zirconium oxide	III
Carbon Dioxide	Horiba Instrument	NDIR	PIR-2000
Carbon Monoxide	Horiba Instrument	NDIR	PIR-2000

2.1.1 Gaseous Emissions

The continuous monitor is equipped with analytical instruments to measure concentrations of NO, CO, CO_2 and O_2 . The sample gas is delivered to the analyzers at the proper condition and flow rate through the sampling and conditioning system shown schematically in Figure 2-1. A probe with a 0.7-micrometer sintered stainless steel filter was installed in the stack to sample the flue gas. The following paragraphs describe the analytical instrumentation.

A. Nitrogen Oxides--

The oxides of nitrogen monitoring instrument used was a Thermo Electron chemiluminescent nitric oxide analyzer. The operational basis of the instrument is the chemiluminescent reaction of NO and O_3 to form NO_2 in an excited state. The resulting chemiluminescence is monitored through an optical filter by a high sensitivity photomultiplier tube, the output of which is electronically processed so it is linearly proportional to the NO concentration.

Air for the ozonator is drawn from ambient through an air dryer and a 10-micrometer filter element. Flow control for the instrument is accomplished by means of a small bellows pump mounted on the vent of the instrument downstream of a separator which insures that no water collects in the pump.

The basic analyzer is sensitive only to NO molecules. To measure NO_x (i.e., NO + NO_2), the NO_2 is first converted to NO. This is accomplished by a converter which is included with the analyzer. The conversion occurs as the gas passes through a thermally insulated, resistance heated, stainless steel coil. With the application of heat, NO_2 molecules in the sample gas are reduced to NO molecules, and the analyzer then reads NO_x . NO_2 is obtained by the difference in readings with and without the converter in operation.

Specifications

Accuracy: 1% of full scale

Span drift: ± 1% of full scale in 24 hours

Zero drift: ± 1 ppm in 24 hours

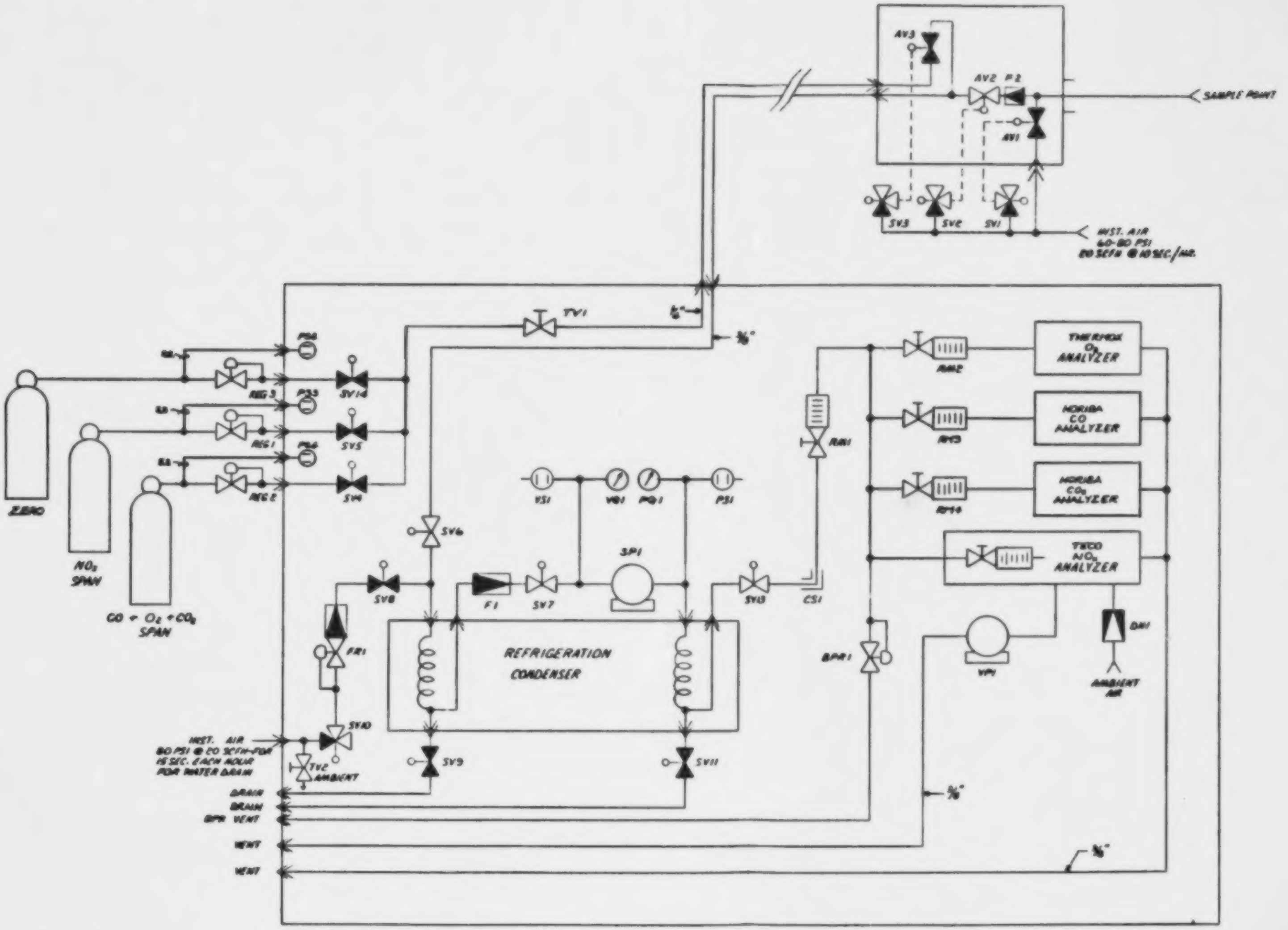
SAMPLE POINT
AV3
AV2
F2
AV1
SV3
SV2
SV1
INST. AIR
60-80 PSI
20 SCFH @ 10 SEC./HR.
TV1
3/8"
PS6
PS5
PS4
REG 3
REG 1
REG 2
SV14
SV5
SV4
ZERO
NO2
SPAN
CO + O2 + CO2
SPAN
VS1
VG1
PG1
PS1
SP1
SV6
SV8
F1
SV7
SV13
CS1
RM1
FR1
REFRIGERATION
CONDENSER
SV10
INST. AIR
80 PSI @ 20 SCFH-FOR
15 SEC. EACH HOUR
FOR WATER DRAIN
TV2
AMBIENT
SV9
SV11
DRAIN
DRAIN
BPR VENT
VENT
VENT
RM2
RM3
RM4
THERMOX
O2
ANALYZER
HORIBA
CO
ANALYZER
HORIBA
CO2
ANALYZER
TECO
NOx
ANALYZER
BPR1
VP1
DM1
AMBIENT
AIR

Figure 2-1. Schematic of continuous monitor sampling and conditioning system.

Power Requirements: 115 ± 10V, 60 Hz, 1000 watts

Response: 90% of F.S. in 1 sec (NO_x mode); 0.7 sec (NO mode)

Output: 4-20 ma

Sensitivity: 0.5 ppm

Linearity: ± 1% of full scale

Vacuum detector operation

Range: 2.5, 10, 25, 100, 250, 1000, 2500, 20,000 ppm full scale

Only the NO concentration was measured during this program. Because of the added complexity of heated sample lines and controllers necessary for measuring NO_2 and the small percentage of NO_2 in the flue gas, based on previous tests, it was decided that only NO measurement was necessary. Therefore, an unheated sample line was installed, and the moisture was removed from the sample gas by a dropout flask and a refrigerated condenser.

B. Carbon Monoxide and Carbon Dioxide--

Carbon monoxide (CO) and carbon dioxide (CO_2) concentrations were measured by Horiba Instruments PIR-2000 short-path-length nondispersive infrared analyzers. These instruments measure the difference in infrared energy absorbed from energy beams passed through a reference cell (containing a gas selected to have minimal absorption of infrared energy in the wave length absorbed by the gas component of interest) and a sample cell through which the sample gas flows continuously. The differential absorption appears as a reading on a scale of zero to 100 percent and is then related to the concentration of the species of interest by calibration curves supplied with the instrument. A linearizer was supplied with the CO analyzer to provide a linear output over the range of interest. The operating ranges for the CO analyzer are zero to 500, zero to 1000, and zero to 2000 ppm, and the ranges for the CO_2 analyzer are zero to 5, zero to 10, and zero to 20 percent.

Specifications

Accuracy: 1% of full scale

Repeatability: ± 0.5% of full scale

Zero drift: ± 1% of full scale in 24 hours

Span drift: ± 1% of full scale in 24 hours

Response time: selectable - 90% of full scale in 0.5, 1.2, 3, or 5 seconds

Power Requirements: 115 VAC ± 10%, 60 Hz

Warm up time: 30 minutes

Output: 0-10 mV

C. Oxygen--

A Thermox Model III oxygen analyzer was used to continuously determine the oxygen content of the flue gas sample. The working element of the gas sensor is a closed-end tube made of zirconium oxide. When hot, it becomes a conductor of electricity because of the mobility of the oxygen ions in its crystal structure. Electrodes of porous platinum are coated onto the inside and outside of the cell and connected to the panel meter.

When the sensing cell is hot, a voltage is produced that indicates how the gas on the sample side compares with the gas on the reference side (ambient air). The voltage is displayed on a panel meter. It is a partial pressure device and responds directly to changes in sample pressure, as well as sample oxygen concentration.

Specifications

Accuracy: ± 1% of actual measured value

Repeatability: ± 0.2% of measured value

Response: 90% of full scale in less than 3 seconds

Drift: Less than 0.1% of sensor cell output per month

Output: Logarithmic signal proportional to O_2 concentration, with volts

2.1.2 Data Recording

The measurements from the gaseous analyzers are continuously recorded on dual-pen strip chart recorders, an automatic data logger and magnetic tape cassettes. These instruments are described in the following paragraphs.

- Strip Chart Recorders

  Three dual-pen Linear Instruments Corp Model 432 strip chart recorders are installed in the continuous monitor. Two recorders are used to record the analyzer outputs and the third recorder is used for back-up. The recorder specifications follow.

Specifications

Recorder type: Null balance DC Servo

Input span: Base span 1 mV to 100 VDC

Accuracy: ± 0.5 percent

Temperature stability: 1 µ/°C

Response: 0.5 sec over full 250 mm span

Zero: Right hand zero, 100% zero suppression

Chart drive: 12 speeds

Chart width: Two channel crossover: 250 mm

Dimensions: 17.8 cm (7") H x 44.5 cm (17.5") W x 30.5 cm (12") D

Power requirements: 115/230 VAC 60 Hz: <20 watts

Weight: 11.4 kg (25 lb)

- ### Automatic Data Logger

The analyzer outputs are continuously recorded on a Monitor Lab Model 9300 microprocessor-based data logger. This data logger has the capability of recording 40 input channels. The data for each analyzer is printed, along with the exact time and date, in a digital form on a built-in inkless printer. The data logger is programmed to sample each analyzer every 4 seconds and print-out averages every 15 minutes. The digital printout lists the number of samples in each averaging period. The data logger specifications are listed below.

Specifications

Inputs: Up to 40 channels of analog voltage, current and temperature inputs can be accommodated in the mainframe.

Voltage ranges: ± 30,000 mV, ± 300.00 mV, ± 3.000 V, ± 12.000 V, Autorange

Resolution: 1 µV on 30.000 mV range

Accuracy: ± 0.02% Reading ± 0.01% range ± 1 digit

Power: 115/230V ± 10%, 60 Hz, <125 watts

Dimension: 18 cm (H) x 48.3 cm (W) x 56 cm (D) (17" x 19" x 22")

Weight: 18.2 kg (40 lb)

- Digital Tape Cassette Recorder

  Data from the automatic data logger are recorded on magnetic tape cassettes with a Techtran Model 816 recorder. This recorder permits the storage of all gaseous emissions data on tape for subsequent use. The characteristics of the recorder follow.

  Specifications

  Storage capacity: 145,000 characters per cassette

  Storage media: Phillips-type magnetic tape cassette

  Tape speed: 20 lps read/write; 120 lps rewind

  Recorder Size: 13 cm (H) x 18 cm (W) x 28 cm (D)
  (5"x 7 1/4" x 11")

  Weight: 2.7 kg (6 lb)

  Temperature range: 283° to 313 K

  Power requirements: 115 VAC 47-63 Hz; 30 watts

2.2 TEST UNIT DESCRIPTION

The process heater tested in this program was a 62.9 m^3/h (9500 bbl/d) natural draft unit firing natural gas. It contained three John Zink LNC-16 low-NO_x burners. The unit was a vertical cylindrical crude heater having both radiant and convection sections and its maximum heat input rate was approximately 5.3 MW (18 x 10^6 Btu/h). This unit was of the same design and size as that of Site 1 described in another final report prepared under this contract, "Emissions From Refinery Process Heaters Equipped with Low-NO_x Burners." However, since the process for which the present heater was used differed from that of the previous unit, throughput rates were different for the two units (although the heat input rates were essentially the same). Also, because of a city ordinance limiting the stack height at the previous site, a small forced draft combustion air fan was required there. A plenum had been constructed around the formerly natural draft burners and the unit had thus been converted to a forced draft heater. The present site had no such stack height limitation and could thus be operated natural draft. Both the present site and the previous site operated with ambient temperature combustion air. The fuel fired at the previous site was a mixture of refinery gas and natural gas in approximately a 50/50 split while the present site fired natural gas only.

The present test unit had a radiant section with an I.D. of 2.41 m (7 ft 11 in.), an O.D. of 2.83 m (9 ft 3-1/2 in.), and a height of 7.62 m (25 ft 0 in.). The inside dimensions of the rectangular convection section were 3.05 m x 0.91 m (10 ft 8 in. x 3 ft 0 in.) with a height of 3.56 m (11 ft 8 in.). From the convection section the flue gas passed through a transition section 1.41 m (4 ft 7-1/2 in.) in height and then through the 9.25 m (30 ft 4-1/2 in.)-tall stack. The stack was uninsulated with a 0.91 m (3 ft 0 in.) I.D.

The long-duration test had originally been planned for the heater tested previously, however, it had been taken out of service for a major rework and was not expected to be back on line for several months. In addition, upon completion of the overhaul it was expected to fire natural gas exclusively. It was thus deemed expedient to conduct the tests on the "sister" unit at the present site.

All emissions sampling was done at the stack downstream of the radiant and convection sections.

Excess air to the firebox was controlled by the stack damper or by means of burner register adjustments. These controls also affected furnace draft which was measured in three places: in the firebox a small distance above the burners, in the convection section, and at the stack. These pressures were maintained negative so as to prevent any combustible gases from escaping through leaks in the firebox. In addition to maintaining a negative pressure in the heater, the criteria used by the operators to adjust the excess air were flame appearance and prevention of flame impingement on process tubes. There was no capability for O_2 measurement on the unit.

Provisions were made for measuring flue gas temperatures at the bridgewall (top of radiant section) and at the stack. Crude charge inlet and outlet temperatures, pressures, and flows were also monitored periodically as well as charge gravity and moisture content.

The average crude inlet temperature was 478 K (400°F) and ranged from about 454 K to 497 K (358°F to 435°F). The crude was heated to an average temperature of 574 K (573°F) with temperatures ranging from about 555 K to 589 K (540°F to 600°F). The bulk flue gas temperature leaving the radiative section of the furnace was measured from August 24 to September 16. It averaged 954 K (1257°F) and ranged from 878 K to 1013 K (1120°F to 1364°F).

SECTION 3.0

TEST RESULTS

This section presents the results of the gaseous emissions measurements made on the gas-fired natural draft process heater equipped with low-NO_x burners.

3.1 CONTINUOUS MONITOR CERTIFICATION TESTS

The continuous monitor described in the previous section was used to measure the heater gaseous emissions. Following shipment to the test site, the monitoring system was installed and certification tests performed in accordance with Performance Specification 2 (PS2) and 3 (PS3), 40 CFR 60 (See Appendix B). These establish minimum performance specifications that the NO monitoring system must meet in terms of eight parameters: accuracy, calibration error, two-and 24-hour zero drifts, two-and 24-hour calibration drifts, response time, and operational period.

The continuous monitor system was installed and instruments were initially calibrated on July 31, 1981. The monitor performance certification began on July 31, 1981 and was completed August 7, 1981. A daily events schedule for the certification tests is presented in Table 3-1.

The performance of the continuous monitor is summarized in Table 3-2. Also shown in the table are the monitor specifications extracted from PS2 and PS3. Included in this table is the performance of the CO analyzer which is not covered by the performance specification. The CO analyzer is used to monitor the combustion conditions in the heater since it is a very sensitive indicator of combustion performance. Tables A-1 through A-14 Appendix A, show the performance of each of the analyzers for the certification tests.

TABLE 3-1. SCHEDULE OF CERTIFICATION TEST EVENTS

Date	Time	Event
7-31-81	0900	Initial 24 hour zero and span reading
		Initial 2 hour zero and span reading
8-01-81	1100	1st 2 hour zero and span drift point
8-01-81	1300	2nd 2 hour zero and span drift point
8-01-81	1500	3rd 2 hour zero and span drift point
8-01-81	0900	1st 24 hour zero and calibration drift point
		Initial 2 hour zero and calibration reading
8-02-81	1100	4th 2 hour zero and span drift point
8-02-81	1300	5th 2 hour zero and span drift point
8-02-81	1500	6th 2 hour zero and span drift point
8-02-81	0900	2nd 24 hour zero and calibration drift point
		Initial 2 hour zero and calibration reading
8-03-81	1100	7th 2 hour zero and calibration drift point
8-03-81	1300	8th 2 hour zero and calibration drift point
8-03-81	1500	9th 2 hour zero and calibration drift point
8-03-81	0900	3rd 24 hour zero and calibration drift point
		Initial 2 hour zero and calibration reading
8-04-81	1100	10th 2 hour zero and calibration drift point
8-04-81	1300	11th 2 hour zero and calibration drift point
8-04-81	1500	12th 2 hour zero and calibration drift point
8-04-81	0900	4th 24 hour zero and calibration drift point
	1000	Initial 2 hour zero and calibration reading
	1200	13th 2 hour zero and calibration drift point
	1400	14th 2 hour zero and calibration drift point
	1600	15th 2 hour zero and calibration drift point
8-05-81	0900	5th 24 hour zero and calibration drift point
8-06-81	0900	6th 24 hour zero and calibration drift point
8-07-81	0900	7th and final 24 hour zero and calibration drift point
8-04-81	0900	Initial Relative Accuracy Test
	0900	1st set of relative accuracy samples taken
	1000	2nd set of relative accuracy samples taken
	1100	3rd set of relative accuracy samples taken
	1300	4th set of relative accuracy samples taken
	1400	5th set of relative accuracy samples taken
	1500	6th set of relative accuracy samples taken
	1600	7th set of relative accuracy samples taken
	1700	8th set of relative accuracy samples taken
	1800	9th set of relative accuracy samples taken
8-06-81	0900	Instrument Response Time Sheets
9-15-81	0900	Final Relative Accuracy Test
9-15-81	0900	1st set of relative accuracy samples taken
9-15-81	1000	2nd set of relative accuracy samples taken
9-15-81	1100	3rd set of relative accuracy samples taken
9-15-81	1300	4th set of relative accuracy samples taken
9-15-81	1400	5th set of relative accuracy samples taken
9-15-81	1500	6th set of relative accuracy samples taken
9-15-81	1600	7th set of relative accuracy samples taken
9-15-81	1700	8th set of relative accuracy samples taken
9-15-81	1800	9th set of relative accuracy samples taken

TABLE 3-2. INSTRUMENT SPECIFICATIONS AND PERFORMANCE

Parameter		EPA Performance Specifications	Performance
A. Thermo Electron Series 10 NO_x Analyzer			
1. Accuracy		$\leq$ 20% of mean ref. value	3.9%
2. Calibration error	mid	$\leq$ 5% of cal gas value	1.31%
	high	$\leq$ 5% of cal gas value	1.23%
3. Zero drift (2 hour)		2% of span	0.07%
4. Zero drift (24 hour)		2% of span	0.12%
5. Calibration drift (2 hour)		2% of span	0.28%
6. Calibration drift (24 hour)		2.5% of span	0.37%
7. Response time		15 minute maximum	52 sec
8. Operational period		168 hour minimum	720 hr
B. Horiba Instruments PIR 2000 CO_2 Analyzer			
1. Zero drift (2 hour)		$\leq$ 0.4 pct CO_2	0%
2. Zero drift (24 hour)		$\leq$ 0.5 pct CO_2	0%
3. Calibration drift (2 hour)		$\leq$ 0.4 pct CO_2	0.3%
4. Calibration drift (24 hour)		$\leq$ 0.5 pct CO_2	0.087%
5. Response time		10 minutes	53 sec
6. Operational period		168 hour minimum	720 hr
C. Thermox Model III O_2 Analyzer			
1. Zero drift (2 hour)		$\leq$ 0.4 pct O_2	0.013%
2. Zero drift (24 hour)		$\leq$ 0.5 pct O_2	0.034%
3. Calibration drift (2 hour)		$\leq$ 0.4 pct O_2	0.054%
4. Calibration drift (24 hour)		$\leq$ 0.5 pct O_2	0.215%
5. Response time		10 minutes	51 sec
6. Operational period		168 hour minimum	720 hr
D. Horiba Instruments PIR 2000 CO Analyzer			
1. Calibration error	mid	$\leq$ 5% of cal gas value	0.56%
	high	$\leq$ 5% of cal gas value	0.26%
2. Zero drift (2 hour)		2% of span	0%
3. Zero drift (24 hour)		2% of span	0%
4. Calibration drift (2 hour)		2% of span	0.12%
5. Calibration drift (24 hour)		2.5% of span	0.14%
6. Response time		15 minute maximum	53 sec
7. Operational period		168 hour minimum	720 hr

The data presented in Table 3-2 show analyzers in the continuous monitor bettered the performance specifications values for each parameter for each instrument.

Certified calibration gases were obtained from Scott Environmental Technology, Inc. The calibration gases included 50% and 90% span gases for the NO, CO_2, CO, and O_2 analyzers, and a zero gas. In addition to the certified analysis supplied by the vendor, sample flasks were taken for the NO calibration gas and sent to an independent laboratory for analysis. The NO calibration gases contained about 10 percent CO_2 in order to eliminate the effect of CO_2 in the flue gas on the NO analyzer output.

Relative accuracy tests for the NO analyzer were performed as outlined in PS2 using EPA Reference Method 7 (phenoldisulfonic acid [PDS] colorimetric) as the standard. Nine sets of three PDS flasks were collected at one hour intervals at the beginning and end of the 30-day test period. All sample flasks were returned to an independent laboratory for anlaysis. The results of the relative accuracy determination are shown in Tables A-16 and A-17 for the start and end of the 30-day tests. Both tests showed that the NO instrument exceeded the accuracy requirements of PS2. The relative accuracy of the Thermo Electron NO analyzer based on the two test series was 3.9 percent.

3.2 GASEOUS EMISSIONS TEST RESULTS

Gaseous emissions data were measured continuously and recorded on an automatic data logger, strip chart recorders and a magnetic tape recorder. The data recorders were described in Section 2.1.2. Fifteen minute averages of NO, O_2, CO_2 and CO emissions were recorded on tape. Strip chart records are used to verify the data logger tapes and to fill in any gaps in the data from the automatic data logger. Daily tabulations of the emissions and unit operating data were provided by a technician on-site. A daily log was also kept with comments relative to unit operation and monitor operation. The emissions and unit operating data are tabulated in a format for input to a computer program.

After the preliminary screening, data were input to the computer and a listing of the 15-minute averages was compiled. The format in which the

15-minute average data are reported is shown as Table 3-3. These data were then used to compile 24-hour averages for the entire test period. A complete listing of the 24-hour averages and the 15-minute averages is included as Appendix C. The right hand column of the print-out is for comments. A key to the comments is included in the Appendix. Comments include start, finish, maintenance, unit malfunction, instrumentation failure, etc. A summary of the 24-hour averages compiled from the 15-minute averages for the 30-day test period is presented in Table 3-4.

During the test period, the heater load or charge rate varied from a low value of 42.5 m^3/h (6411 bbl/day) to a maximum of 57.2 m^3/h (8638 bbl/day). This corresponds to a variation from 67 percent to 90 percent of rated capacity. The fluctuation in daily average heater load is shown in Figure 3-1 for the test period. The load values were compiled from the plant operator's daily log sheet. Fuel flow measurements were unavailable. The heat input rates were estimated from the fuel and stack gas analyses.

Figures 3-2 through 3-6 show the daily average gaseous emissions as a function of time for the test period. Figure 3-2 shows daily average stack oxygen concentration as a function of time from the start of testing. During the first nine days of the endurance test the heater operated at an average of 3.8 percent O_2 (1.9 to 9.8 percent O_2). After nine days of testing the heater had to be shut down for maintenance. The peak O_2 value occurred when the heater was brought back on line after being down for 13 days. The stack O_2 was then lowered to about 6.8 percent by the operators. The operators were then requested to further lower the stack O_2. The heater then operated for seven days at an average O_2 of 5.0 percent before an upset was caused by a faulty charge compressor. This caused large fluctuations in load which forced the operators to increase O_2 to an average of 7.8 percent to prevent smoking from occurring during load surges. The O_2 was then subsequently lowered to 6.4 percent for the remainder of the test period. The heater has no O_2 measurement system (either permanently installed or portable) and only a manual damper control, so upsets in firing rate (or load) result in fairly large fluctuations in stack O_2 concentration due to over-compensation by the operators. This is the reason why the operators preferred maintaining a

TABLE 3-3. FORMAT OF 15-MINUTE AVERAGE EMISSIONS DATA

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA

DATE	TIME	LOAD bbl/day*	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
			DRY STACK GAS CONCENTRATION								
8/ 5/81	1215	8580.0	4.5	9.3	7	82	7	89	2	48	
8/ 5/81	1230	8580.0	4.5	9.3	6	82	6	89	2	48	
8/ 5/81	1245	.0	.0	.0	0	0	0	0	0	0	C
8/ 5/81	1300	8580.0	4.7	9.2	7	81	7	89	2	48	
8/ 5/81	1315	8580.0	4.8	9.1	6	81	6	90	2	48	
8/ 5/81	1330	8580.0	4.4	9.4	6	83	6	90	2	48	
8/ 5/81	1345	8580.0	4.0	9.6	6	82	6	86	2	47	
8/ 5/81	1400	8580.0	4.2	9.5	6	82	6	87	2	47	
8/ 5/81	1415	8580.0	4.3	9.4	6	82	6	88	2	47	
8/ 5/81	1430	8580.0	4.1	9.5	7	81	7	86	2	46	
8/ 5/81	1445	8580.0	3.8	9.7	7	82	7	85	2	46	
8/ 5/81	1500	8580.0	3.2	10.1	7	82	7	82	2	44	
8/ 5/81	1515	8580.0	3.1	10.1	7	83	7	83	2	45	
8/ 5/81	1530	8580.0	2.8	10.3	8	84	7	83	2	45	
8/ 5/81	1545	8580.0	3.1	10.1	8	85	8	85	2	46	
8/ 5/81	1600	8580.0	3.5	9.9	8	85	8	87	2	47	
8/ 5/81	1615	8580.0	3.2	10.0	8	85	8	85	2	46	
8/ 5/81	1630	.0	.0	.0	0	0	0	0	0	0	C
8/ 5/81	1645	8580.0	3.6	9.8	8	84	8	86	2	47	
8/ 5/81	1700	8580.0	3.5	9.9	8	84	8	86	2	46	
8/ 5/81	1715	8580.0	3.1	10.1	8	84	8	84	2	45	
8/ 5/81	1730	8580.0	3.1	10.1	8	84	8	84	2	45	
8/ 5/81	1745	8580.0	3.7	9.7	8	84	8	87	2	47	
8/ 5/81	1800	8580.0	3.8	9.7	9	84	9	87	3	47	
8/ 5/81	1815	8580.0	3.9	9.6	9	83	9	87	3	47	
8/ 5/81	1830	8580.0	3.4	9.9	9	84	9	85	3	46	
8/ 5/81	1845	8580.0	3.5	9.9	9	84	9	86	3	46	
8/ 5/81	1900	8580.0	3.6	9.8	9	84	9	86	3	47	
8/ 5/81	1915	8580.0	3.7	9.7	9	84	9	87	3	47	
8/ 5/81	1930	8580.0	3.6	9.8	8	84	8	86	2	47	
8/ 5/81	1945	8580.0	3.1	10.1	9	84	9	84	2	45	
8/ 5/81	2000	8580.0	2.8	10.1	8	84	7	83	2	45	
8/ 5/81	2015	8580.0	3.1	10.1	10	84	10	84	3	45	
8/ 5/81	2030	8580.0	2.9	10.2	10	84	9	83	3	45	
8/ 5/81	2045	8580.0	2.4	10.5	11	84	10	81	3	44	
8/ 5/81	2100	8580.0	2.1	10.7	11	84	10	79	3	43	
8/ 5/81	2115	8580.0	2.9	10.2	11	84	10	83	3	45	
8/ 5/81	2130	8580.0	3.5	9.8	10	84	10	86	3	46	
8/ 5/81	2145	8580.0	3.6	9.8	10	84	10	86	3	47	
8/ 5/81	2200	8580.0	3.3	10.0	10	84	10	85	3	46	
8/ 5/81	2215	8580.0	3.4	9.9	10	84	10	85	3	46	
8/ 5/81	2230	8580.0	3.4	9.9	10	84	10	85	3	46	
8/ 5/81	2245	8580.0	3.2	10.0	10	84	10	84	3	46	
8/ 5/81	2300	8580.0	2.6	10.0	10	83	9	81	3	44	
8/ 5/81	2315	8580.0	2.8	10.3	11	84	10	83	3	45	
8/ 5/81	2330	8580.0	3.2	10.0	10	84	10	84	3	46	
8/ 5/81	2345	8580.0	3.2	10.0	10	84	10	84	3	46	
8/ 5/81	2400	8580.0	3.0	10.1	11	84	11	84	3	45	

* barrels/day

TABLE 3-4. SUMMARY OF DAILY AVERAGE GASEOUS EMISSIONS

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

24 HOUR DATA

DRY STACK GAS CONCENTRATION

DATE	LOAD bbl/day*	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J
7/31/81	7920.0	3.1	10.2	11	79	11	79	3	43
8/ 1/81	7920.0	3.8	9.5	7	80	7	83	2	45
8/ 2/81	7920.0	4.0	9.3	8	79	8	83	2	45
8/ 3/81	7920.0	4.7	9.1	7	77	7	85	2	46
8/ 4/81	7755.0	3.5	9.5	7	80	7	82	2	44
8/ 5/81	8580.0	3.8	9.4	8	81	8	84	2	46
8/ 6/81	8580.0	4.0	9.2	6	80	6	84	2	45
8/ 7/81	8580.0	3.3	10.0	6	79	6	80	2	43
8/ 8/81	8580.0	4.2	9.3	5	78	5	83	1	45
8/21/81	6550.0	10.6	5.1	48	41	83	71	27	38
8/22/81	6550.0	7.8	7.1	6	60	8	82	2	44
8/23/81	6700.0	6.3	7.9	6	68	7	83	2	45
8/24/81	7150.0	7.1	7.5	8	69	10	89	3	48
8/25/81	7150.0	7.1	8.0	11	69	14	89	4	48
8/26/81	6411.6	6.6	8.1	5	71	6	88	2	48
8/27/81	6524.8	6.7	8.1	5	69	6	86	2	47
8/28/81	7531.5	6.9	7.9	7	68	8	87	2	47
8/29/81	8638.2	5.4	8.9	6	71	6	82	2	44
8/30/81	8290.0	4.2	9.6	22	72	23	77	7	41
8/31/81	8290.0	4.5	9.3	13	72	14	78	4	42
9/ 1/81	8425.5	5.2	8.7	7	69	7	78	2	42
9/ 2/81	8500.0	4.7	9.6	49	84	53	92	17	50
9/ 3/81	7546.8	5.3	10.4	6	78	6	89	2	48
9/10/81	6990.5	5.8	9.0	18	68	21	80	7	43
9/11/81	7000.0	7.5	7.9	21	62	28	82	9	44
9/12/81	7000.0	8.5	7.3	30	51	43	73	14	39
9/14/81	7000.0	7.4	7.9	12	64	15	84	5	46
9/15/81	7000.0	6.2	8.8	15	69	18	84	6	45
9/16/81	7000.0	5.8	9.0	16	74	19	87	6	47
9/17/81	6892.3	6.3	8.8	15	73	18	89	6	48
9/18/81	6849.5	6.9	7.7	12	68	15	87	5	47
9/19/81	6935.3	6.7	8.6	16	71	20	89	6	48
9/20/81	7000.0	6.4	8.7	17	69	20	85	6	46

* barrels/day

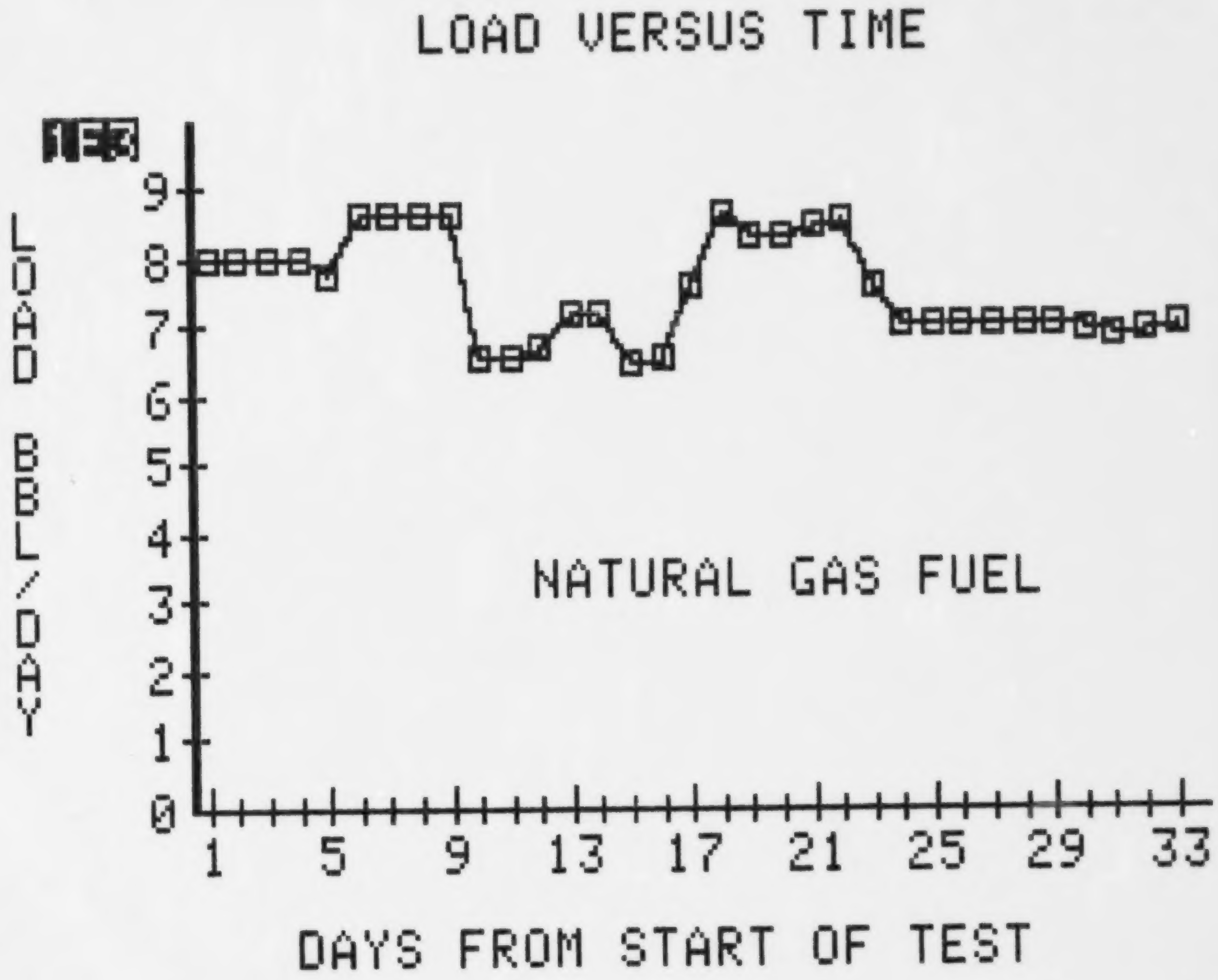

Figure 3-1. Process Heater Load as a Function of Time

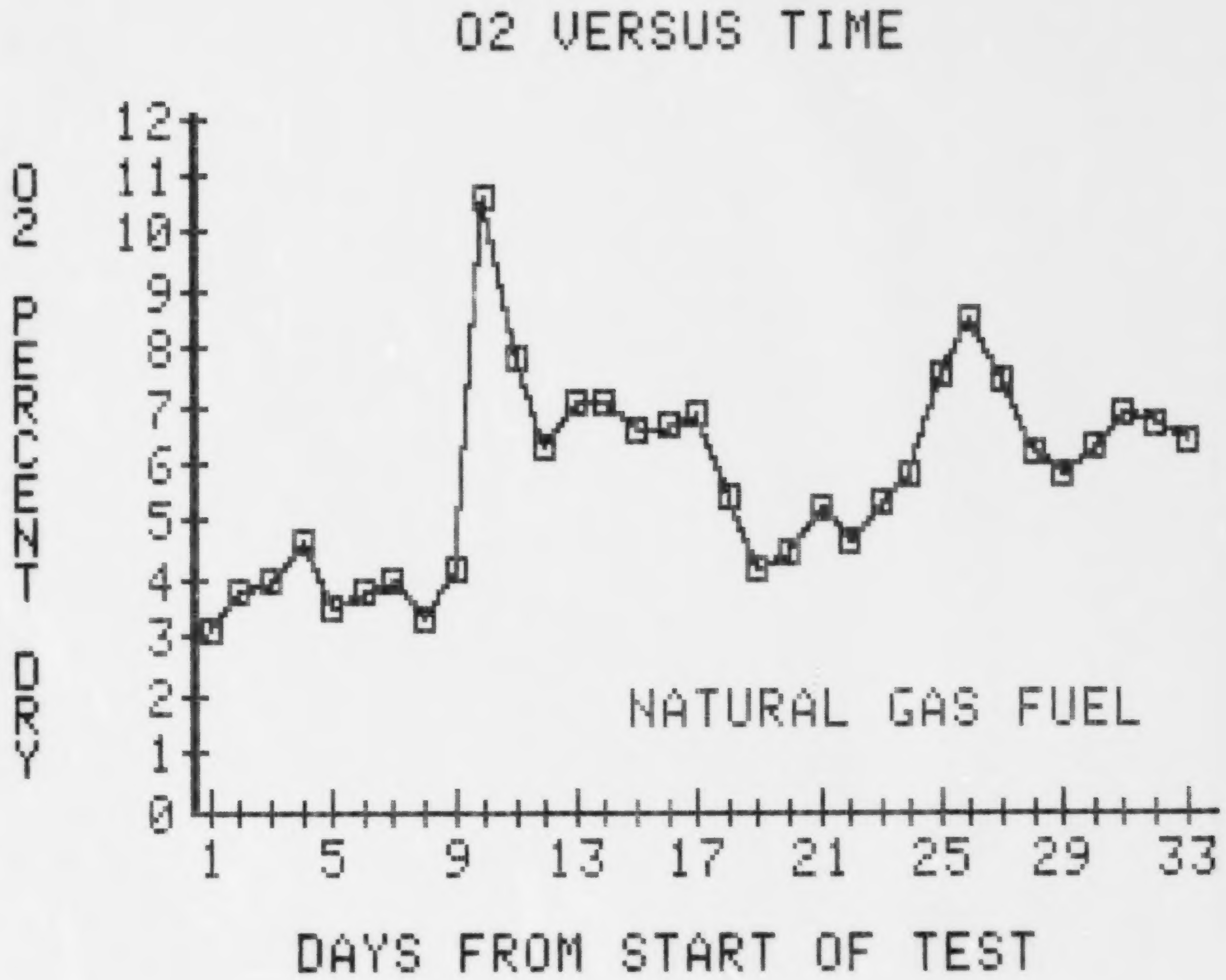

Figure 3-2. Daily Average O_2 Concentration as a Function of Time

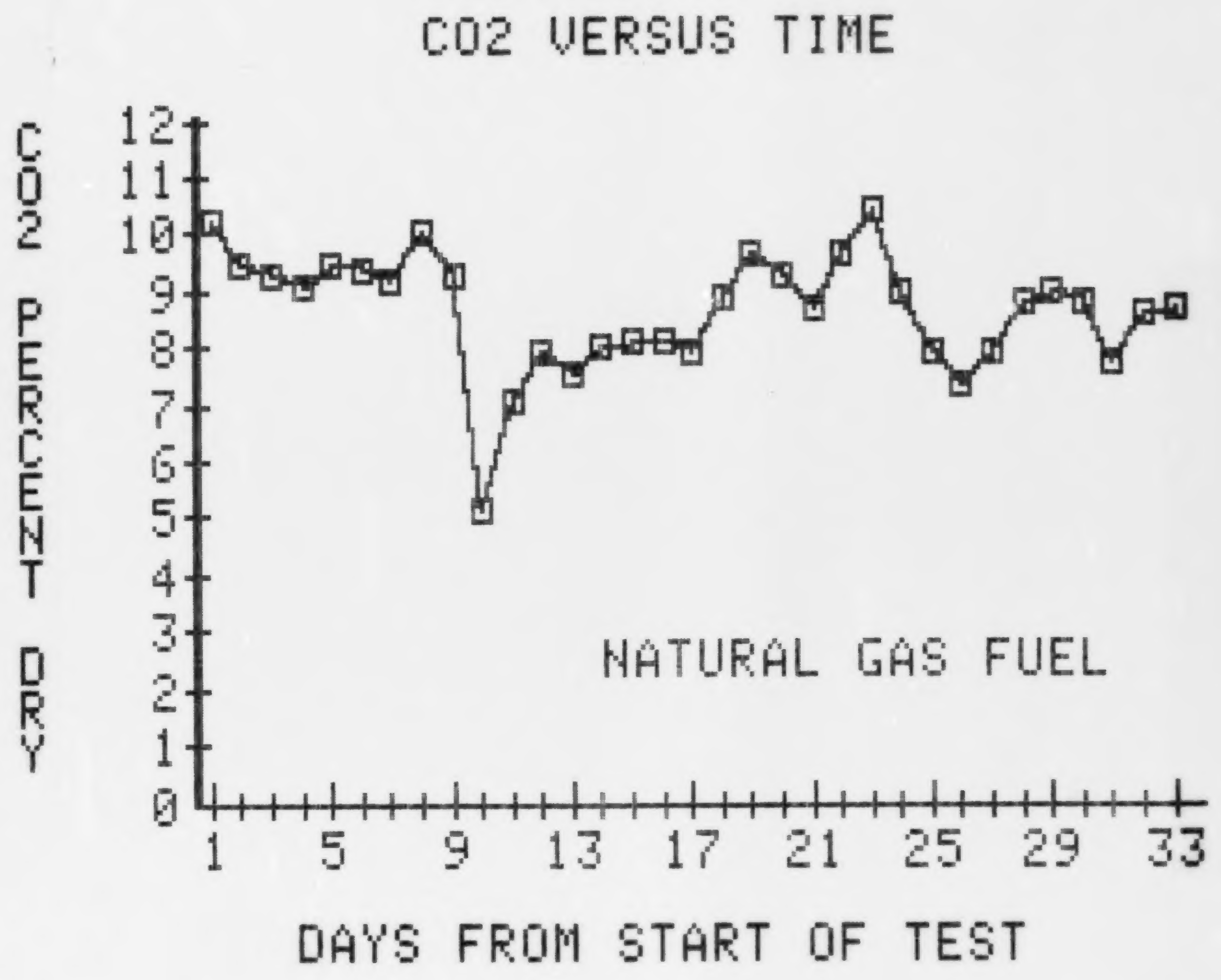

Figure 3-3. Daily Average CO_2 Concentration as a Function of Time

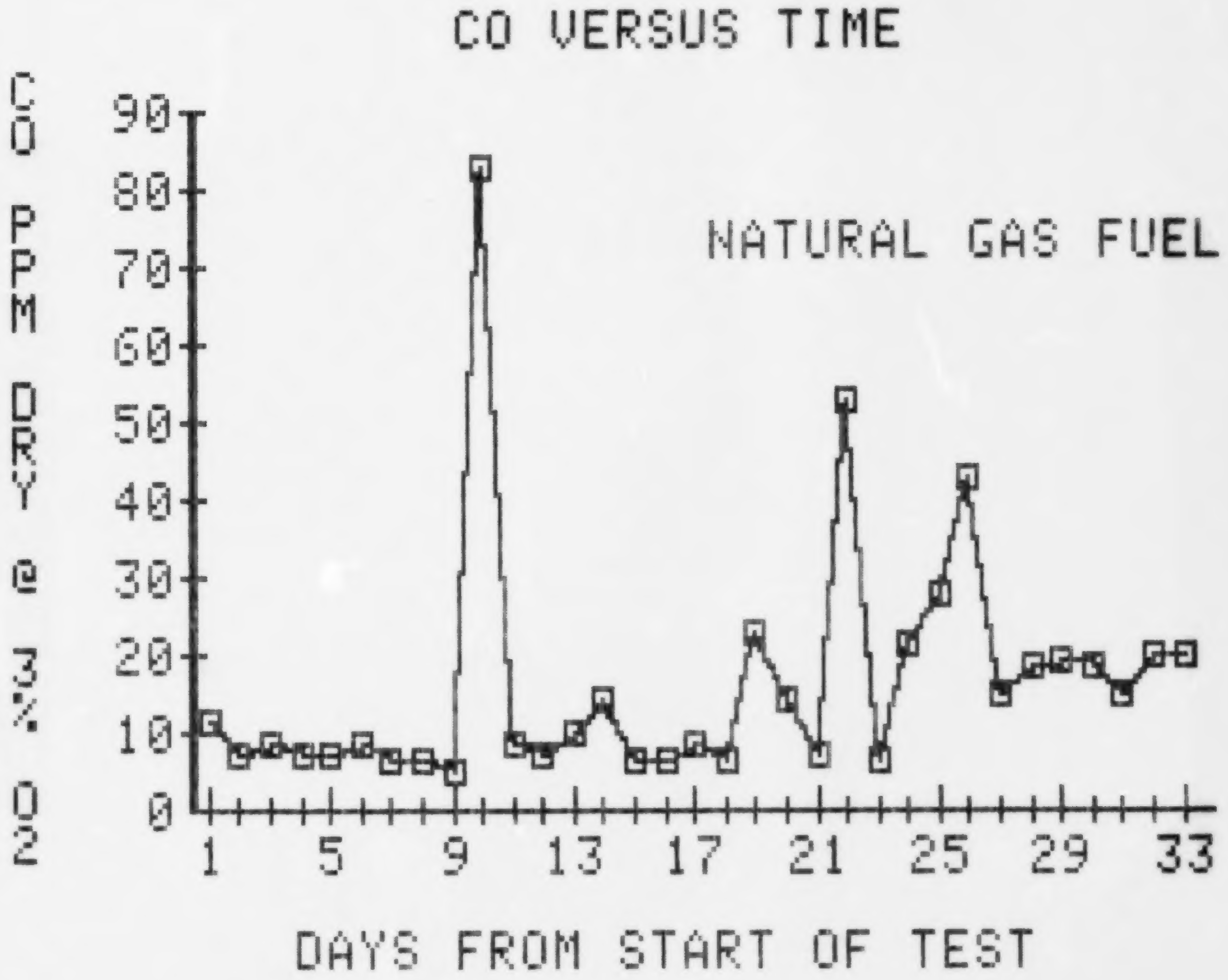

Figure 3-4. Daily Average CO Concentration as a Function of Time

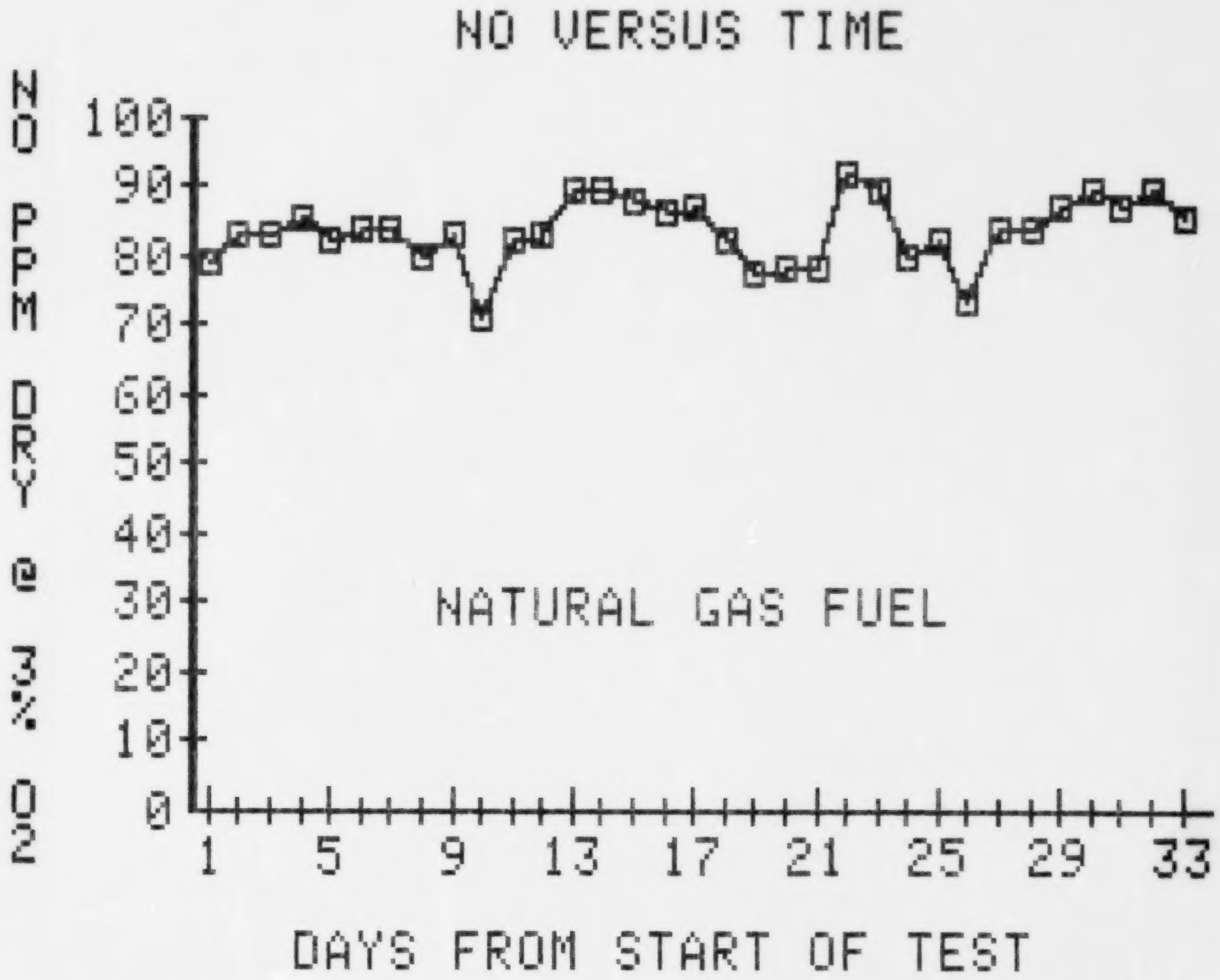

Figure 3-5. Daily Averages of NO Concentration as a Function of Time

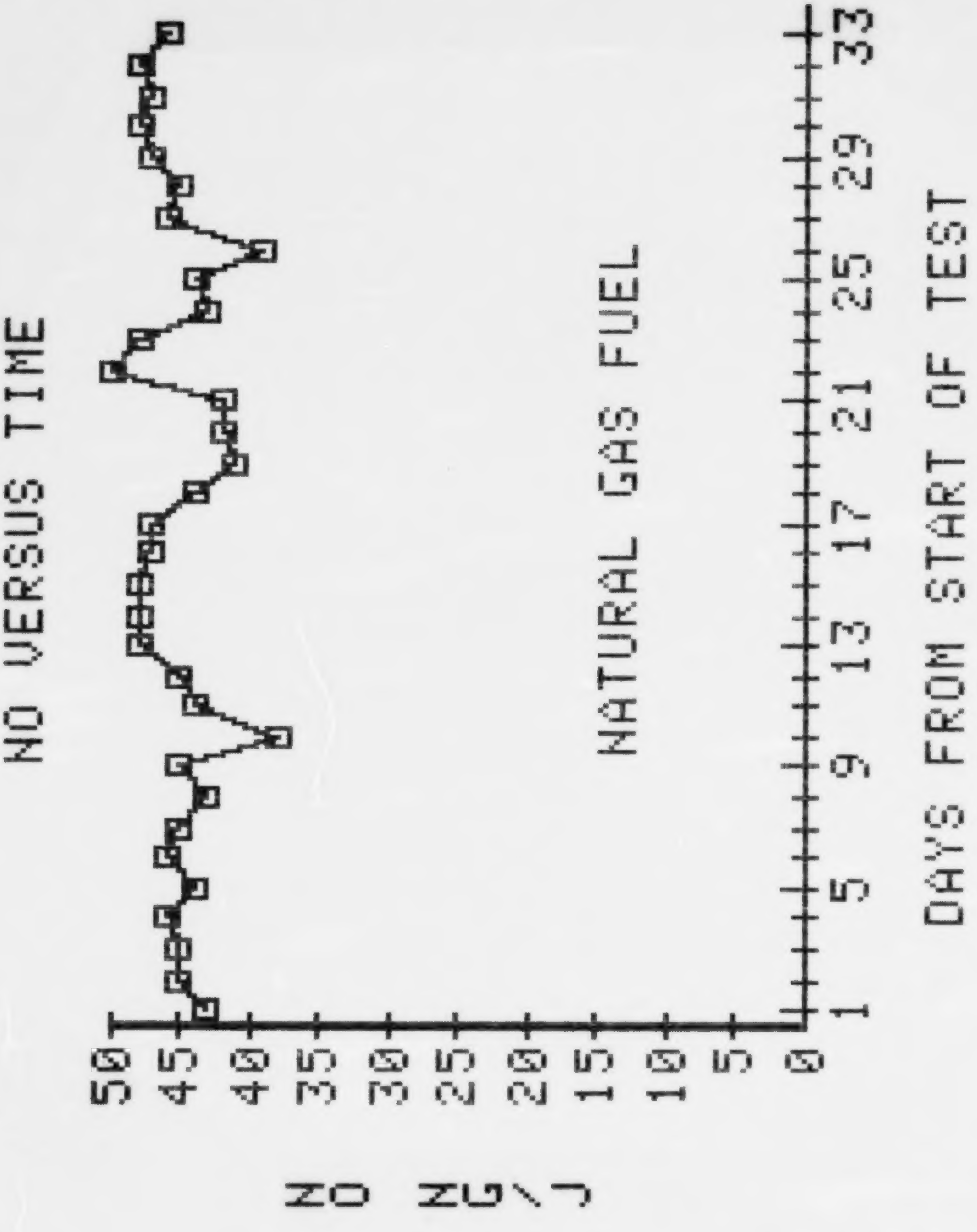

Figure 3-6. Daily Average NO Emission Rate as a Function of Time

fairly high O_2 concentration (>5.0 percent). The corresponding daily average emissions are shown in Figure 3-3 through 3-6. CO emissions, shown in Figure 3-4 show dramatic changes in concentration but the peak values are still very low - less than 100 ppm. The data serve to show the sensitivity of CO emissions on combustion conditions. Both CO_2 and O_2 were measured to provide redundancy in the dilution correction factor. A plot of CO_2 versus O_2 is shown in Figure 3-7 for the daily averages.

A linear regression analysis was performed on the CO_2 - O_2 data. The correlation coefficient, r^2, was calculated to be 0.84 which shows good correlation. The equation for the data fit is:

$$[CO_2 = 11.9 - 0.569\ (O_2)]$$

Fuel samples were taken periodically throughout the test period. The fuel burned throughout the test was natural gas. The analyses of the fuel consistently showed evidence of air in the fuel. This was indicated both by KVB analyses and analyses conducted by an independent laboratory. The natural gas fuel analyses are summarized in Table 3-5. It is not known to what extent this partial premixing of fuel and air may have affected NO_x emissions since no tests were conducted with pure fuel.

The effect of heater load changes on stack oxygen concentration is shown in Figure 3-8. These data show that the stack O_2 concentration is strongly influenced by the heater load or firing rate. Without active stack damper controls, the oxygen concentration tends toward high values as the heater firing rate diminishes. The effect of stack oxygen on CO concentration is shown in Figure 3-9. These data show no real correlation. The points where both CO and O_2 are high are points where the heater was in a upset condition and combustion conditions were varying greatly. The NO concentration as a function of stack O_2 concentration is shown in Figure 3-10. These data also show that the NO emissions are not a linear function of O_2 concentration in this heater. It should be noted that gradual load changes accomplished over a period of hours could occur with only minor variations in

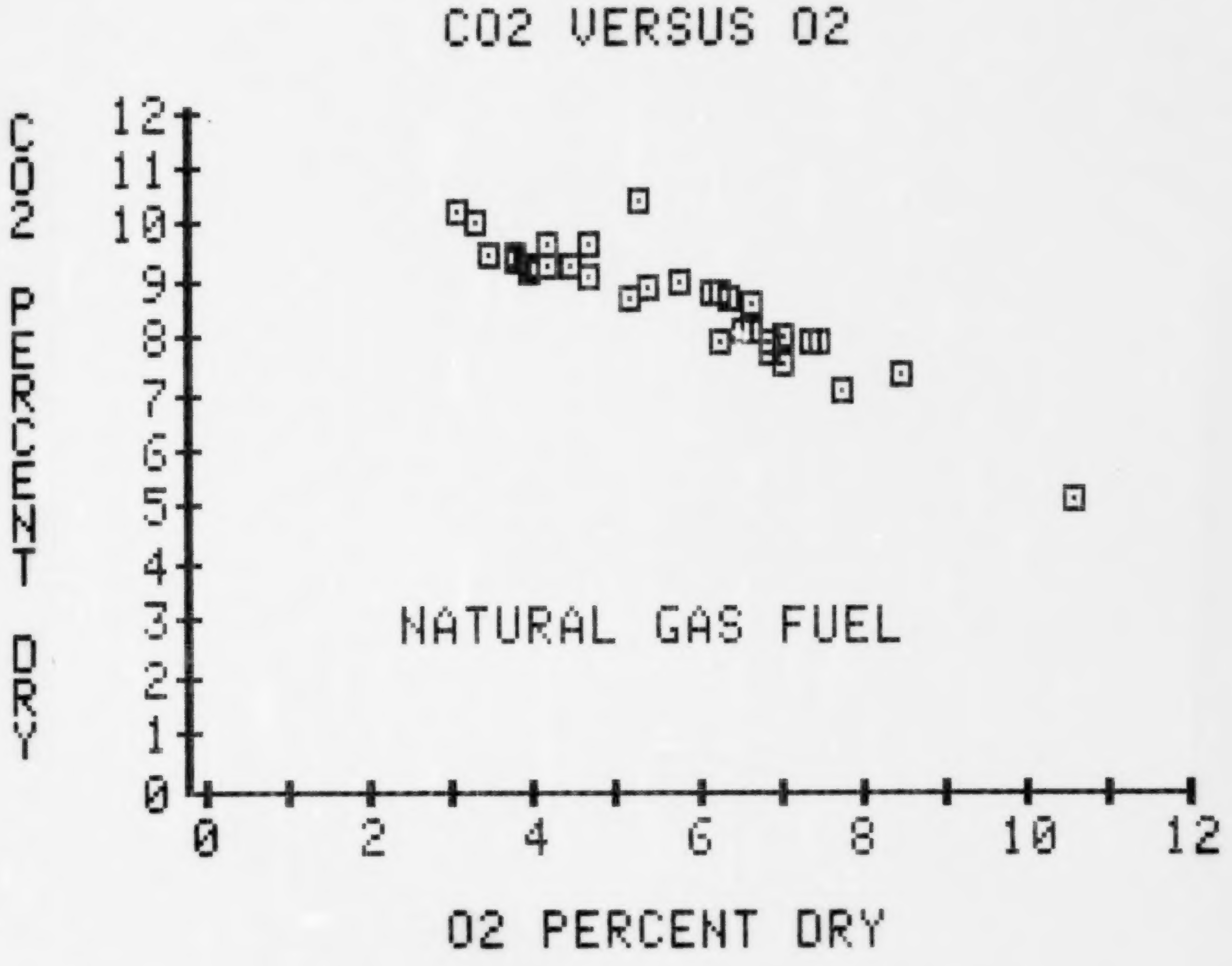

Figure 3-7. Measured CO_2 as a Function of Measured O_2

TABLE 3-5. NATURAL GAS FUEL ANALYSES

	Volume Percentages				
Date	8-14-81	8-14-81	8-19-81	9-11-81*	Average
Sample	1	2	1	1	
Gas Constituent					
Methane	65.3	65.2	74.2	71.9	69.2
Ethane	4.35	4.42	4.96	5.2	4.7
Propane	1.78	1.92	2.14	2.1	2.0
Butane	0.50	0.50	0.3	0.6	0.5
Pentane	0.09	0.10	0.1	0.1	0.1
Oxygen	3.49	3.39	3.58	4.0	3.6
Nitrogen	27.11	27.81	19.6	16.0	22.6
Carbon Dioxide	1.49	1.70	2.0	0.1	1.3
HHV, kJ/m^3	29,472	29,621	33,235	32,900	31,307
(Btu/ft^3)	(791)	(795)	(892)	(883)	(840)
Spec. Gravity	0.77	0.74	0.73	0.71	0.74

*Analysis by an independent laboratory

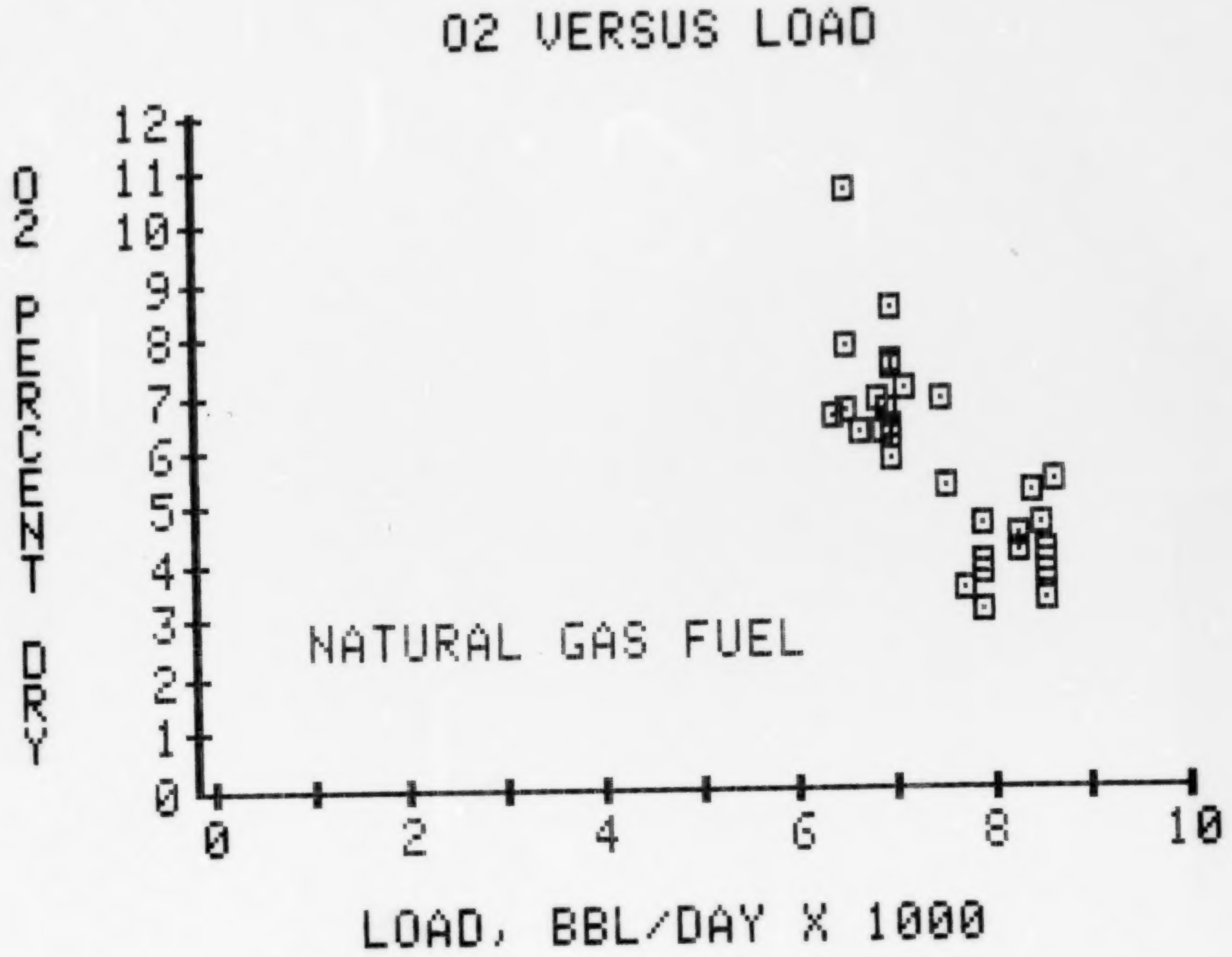

Figure 3-8. The Effect of Heater Load on Stack Oxygen Concentration

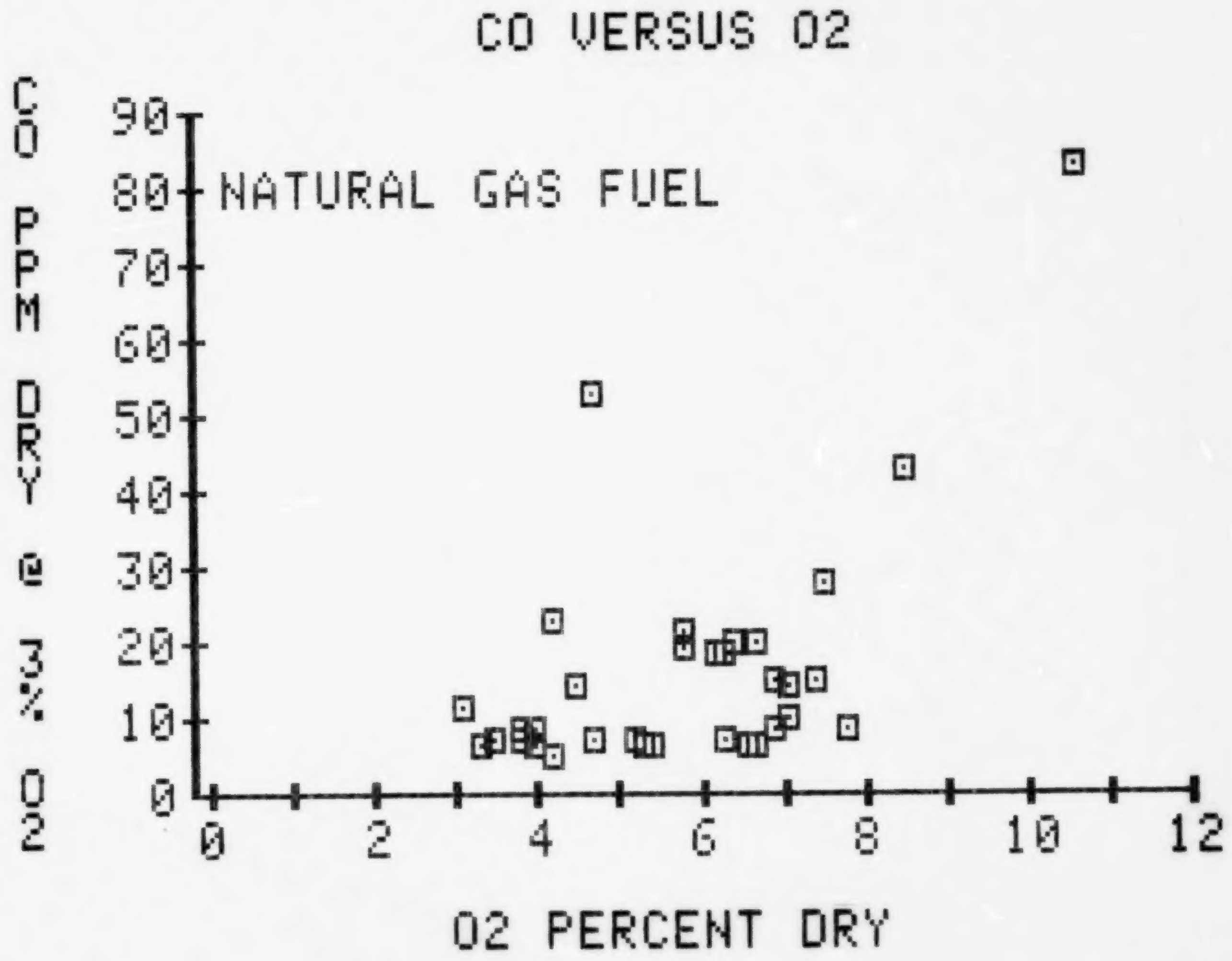

Figure 3-9. CO Concentration as a Function of Stack Oxygen Concentration

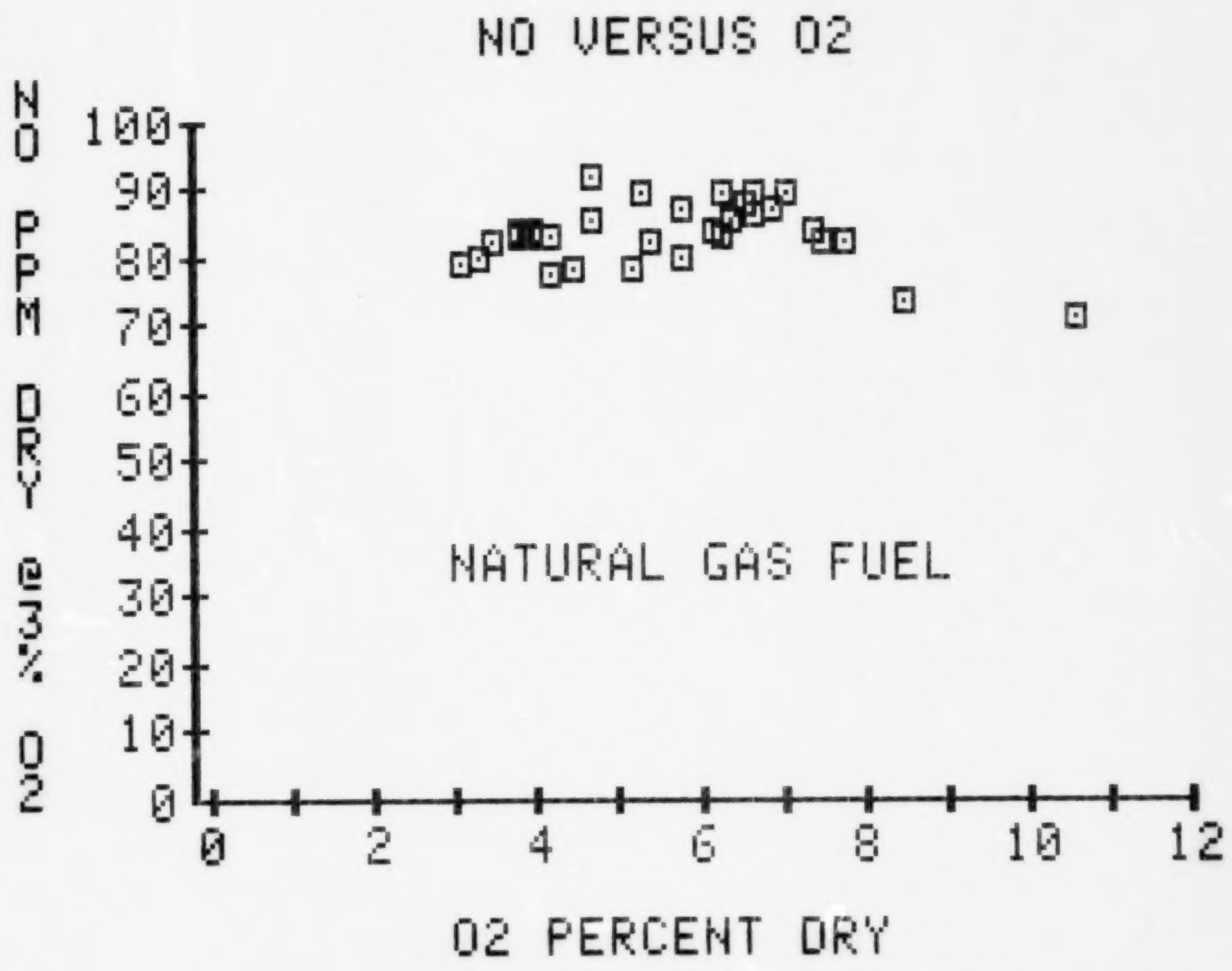

Figure 3-10. NO Emissions as a Function of Stack Oxygen Concentration

stack O_2. However, rapid changes in throughput (such as those caused by the charge compressor problems) can drastically alter the flue gas composition.

Regression analyses were conducted with the 24-hour average NO data and the stack oxygen concentration. For each heater load range, it appears that a second degree polynomial fits the data better than a linear equation. The following equations give good correlations of the data.

(1) Load = 7920 bbl/day
$\ln NO = 3.2256 - 0.20290 (\ln \% O_2)^2 + 0.70328 (\ln \% O_2)$
Coefficient of determination, $r^2 = 0.98733$

(2) Load = 8580 bbl/day
$\ln NO = -0.7775 - 2.5336 (\ln \% O_2)^2 + 6.8271 (\ln \% O_2)$
Coefficient of determination, $r^2 = 0.91722$

(3) Load = 7000 bbl/day
$\ln NO = 2.327 - 0.0372 (\% O_2)^2 + 0.4742 (\% O_2)$
Coefficient of determination, $r^2 = 0.8875$

The daily average NO emission rate was plotted on normal probability paper and is shown as Figure 3-11. These data show clearly that the data are not normally distributed. Normal distribution of data results in a straight line when plotted on probability paper. Next, the data were plotted on logarithmic-probability paper as shown in Figure 3-12. These data result in a staight line which indicates the data are best represented by a log-normal distribution. Examinaton of this figure shows the mean NO value to be 44 ng/J (0.10 lb/10^6 Btu). The geometric dispersion, which is analogous to a standard deviation in a normal distribution, is 1.07. The figure shows that 99 percent of the values are less than 50 ng/J (0.116 lb/10^6 Btu).

Linear regression of the 24-hour average NO data versus stack O_2 for four average heater throughput rates (selected to represent the load regimes at which the heater was operated as indicated in Figure 3-1) failed to produce a definitive correlation of NO emissions with stack O_2. Apparently, over the range of stack O_2 tested the NO emissions are not sensitive to the level of oxygen in the flue gas.

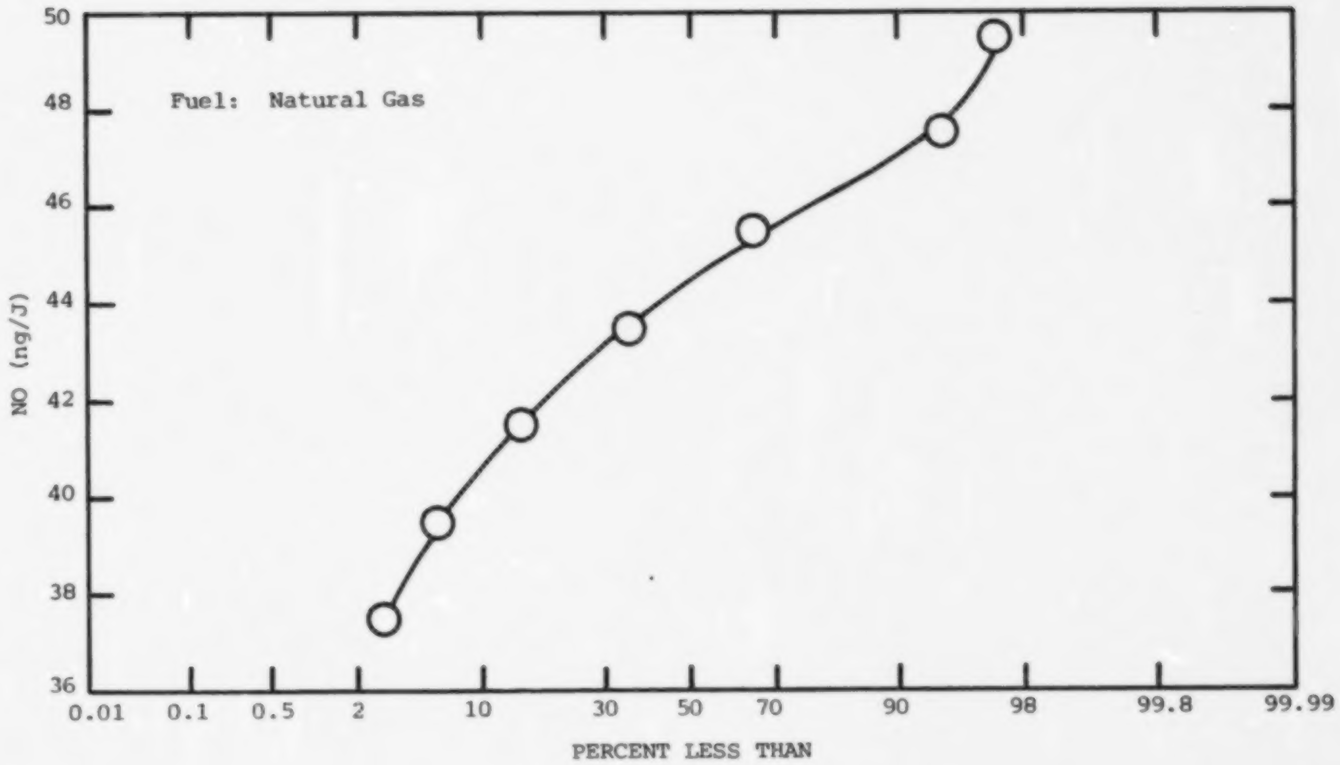

Figure 3-11. Normal Probability Plot of NO Emission Rate - Process Heater with Low-NO_x Burners

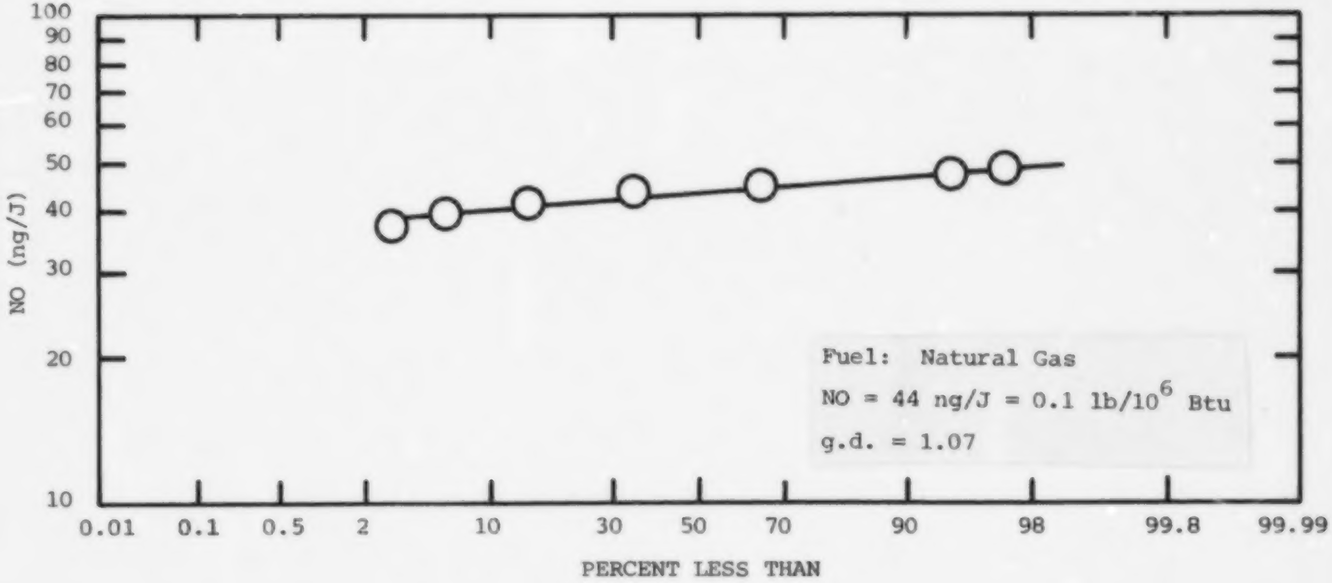

Figure 3-12. Log-Probability Plot of NO Emission Rate - Process Heater with Low-NO_x Burners

APPENDIX A

CONTINUOUS MONITOR CERTIFICATION DATA SHEETS

The data sheets in this appendix show the data collected during the certification of the continuous monitor. The data sheets are those specified in the Federal Register (40 CFR 60). The data from those sheets were used to calculate monitor performance which is summarized in Section 3.1.

Reference Method 7 (PDSA) Tests of NO Calibration Gas

	Calibration Gas Concentration (ppm)		PDSA Results (ppm)	
	Mid Range	High Range	Mid Range	High Range
8/4/81			145	
8/4/81			140	236
8/4/81	143	221.4	144	236
		Average	143	236
9/15/81			No flasks taken	211
9/15/81				232
9/15/81	143	221.4		214
		Average		219

MONITOR PERFORMANCE TEST DATA SHEET

ACCURACY DETERMINATION (NO_x)

Engineer TIDONA

2nd Set

Test No.	Date and Time	Reference Method Samples				Analyzer 1-Hour Average (ppm)*		Difference (ppm)	
		NO_x Sample 1 (ppm) dry @ 3% O_2	NO_x Sample 2 (ppm) dry @ 3% O_2	NO_x Sample 3 (ppm) dry @ 3% O_2	NO_x Sample Average (ppm) dry @ 3% O_2		NO_x dry at 3% O_2		NO_x
1	9-15-81 0930	BAD FLASK	98	94	96		90		+6
2	1030	90	87	83	87		87		0
3	1130	88	94	87	90		87		+3
4	1230	90	89	84	88		90		-2
5	1330	116	89	72	92		88		+4
6	1430	78	86	84	83		82		+1
7	1530	109	90	95	98		93		+5
8	1630	94	92	94	93		92		+1
9	1730	93	94	95	94		92		+2

Mean reference method test value (NO_x) 91

Mean of the differences 2.2

95% Confidence intervals = ± 2.0 ppm (NO_x)

$$\text{Accuracies} = \frac{\text{Mean of the differences + 95\% confidence interval}}{\text{Mean reference method value}} \times 100 = 4.6\ \%\ (NO_x)$$

* Explain and report method used to determine integrated averages

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MONITOR PERFORMANCE TEST DATA SHEET

ACCURACY DETERMINATION (NO_x)

Engineer________________

Test No.	Date and Time	Reference Method Samples				Analyzer 1-Hour Average (ppm)*		Difference (ppm)	
		NO_x Sample 1 (ppm) dry @3% O_2	NO_x Sample 2 (ppm) dry @3% O_2	NO_x Sample 3 (ppm) dry @3% O_2	NO_x Sample Average (ppm) @ 3% O_2	dry @ 3% O_2	NO_x		NO_x
1	8-4-81 0945	80	85	83	83		88		+5
2	0945	96	95	97	96		88		-8
3	1045	108	92	90	97		93		-4
4	1145	92	91	92	92		92		0
5	1245	84	85	93	87		90		+3
6	1345	86	80	84	83		85		+2
7	1445	82	87	77	82		82		0
8	1545	85	92	Bad Flask	89		90		+1
9	1645	89	88	91	89		92		+3

Mean reference method test value (NO_x) 89

Mean of the differences 0.22

95% Confidence intervals = ± 3.07 ppm (NO_x)

$$\text{Accuracies} = \frac{\text{Mean of the differences} + 95\%\ \text{confidence interval}}{\text{Mean reference method value}} \times 100 = 3.2\ \%\ (NO_x)$$

* Explain and report method used to determine integrated averages

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MONITOR PERFORMANCE TEST DATA SHEET

ANALYSIS OF CALIBRATION GAS MIXTURES

Date: SEPT. 29, 1

Reference Method Used: 7

Mid-Range Calibration Gas Mixture

Sample 1 145 **ppm**

Sample 2 140 **ppm**

Sample 3 144 **ppm**

Average 143 **ppm**

High-Range (span) Calibration Gas Mixture

Sample 1 236 **ppm**

Sample 2 236 **ppm**

Sample 3 — **ppm**

Average 236 **ppm**

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CO

MONITOR PERFORMANCE TEST DATA SHEET
ZERO AND CALIBRATION DRIFT (2 HOUR)

Data Set No.	Time		Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
	Begin	End						
1	1000		8/3/81	0.00	—	501.	—	—
2	1200		"	0.00	0	501.	0	0
3	1400		"	0.00	0	500	-1.	-1
4	1600		8/3/81	0.00	0	500	0	0
5	0910		8/4/81	0.00	—	501.	—	—
6	1110		"	0.00	0	500	-1.	-1
7	1310		"	0.00	0	498	-2	-2
8	1510		"	0.00	0	499	1	+1
9	1710		"	0.00	0	499	0	0
10	0830		8-5-81	0.00	—	501	—	—
11	1030		"	0.00	0	501	0	0
12	1230		"	0.00	0	499	-2	-2
13	1430		"	0.00	0	500	+1	+1
14	0930		8/6/81	0.00	—	501	—	—
15	1130		"	0.00	0	499	-2	-2
16	1330		"	0.00	0	497	-2	-2
17	1530		"	0.00	0	496	-1	-1
18	0900		8/7/81	0.00	—	501	—	—
19	1100		"	0.00	0	500	-1.	-1
20	1300		"	0.00	0	501	+1	+1

Zero Drift = [Mean Zero Drift* 0.0 + CI (Zero) 0.0] ÷ [Span] 1000 ppm x 100 = 0.0%.

Calibration Drift = [Mean Span Drift* 0.600 + CI (Span) 0.62] ÷ [Span] 1000 ppm x 100 = 0.12%.

*Absolute Value.

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NO

MONITOR PERFORMANCE TEST DATA SHEET
ZERO AND CALIBRATION DRIFT (2 HOUR)

NO ANALYZER

Data Set No.	Time		Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift Δ(Span-Zero)
	Begin	End						
1	1000		8/3/81	0.00	–	143	–	–
2	1200		"	0.00	0	142.5	-0.5	-0.5
3	1400		"	0.3	+.3	143.0	+0.5	+0.2
4	1600		"	0.3	0	143.0	0	0
5	0910		8-4-81	0.00	–	143.0	–	–
6	1110		"	0.00	0	143.5	+0.5	+0.5
7	1310		"	0.00	0	142.6	-0.9	-0.9
8	1510		"	0.00	0	142.6	0	0
9	1710		"	0.00	0	142.0	-0.6	-0.6
10	0830		8/5/81	0.00	–	143.0	–	–
11	1030		"	0.00	0	144.0	+ 1.0	+1.0
12	1230		"	0.05	+.05	143.2	-0.8	-1.3
13	1430		"	0.05	0	144.0	+0.8	+0.8
14	0930		8/6/81	0.00	–	143.0	–	–
15	1130		"	-1.0	-1.0	143.0	0	+1.0
16	1330		"	-0.8	+0.2	142.0	-1.0	-1.2
17	1530		"	-.5	+0.3	144.0	+2.0	+1.7
18	0900		8/7/81	0.00	–	143.0	–	–
19	1100		"	0.09	+.09	142.0	-1.0	-1.09
20	1300		"	0.00	-.09	144.0	+2.0	+2.09

Zero Drift = [Mean Zero Drift* 0.01 + CI (Zero) 0.165] ÷ 250 ppm [Span] x 100 = 0.07.

Calibration Drift = [Mean Span Drift* 0.113 + CI (Span) 0.587] ÷ 250 [Span] x 100 = 0.28%.

*Absolute Value of the mean.

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O_2

MONITOR PERFORMANCE TEST DATA SHEET
ZERO AND CALIBRATION DRIFT (2 HOUR)

Data Set No.	Time		Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift Δ(Span-Zero)
	Begin	End						
1	1000		8/3/81	0.100	–	10.00	–	–
2	1200		"	0.100	0	9.95	-.05	-0.05
3	1400		"	0.100	0	9.95	0	0
4	1600		"	0.100	0	9.98	+.03	+0.03
5	0910		8/4/81	0.100	–	9.98	–	–
6	1110		"	0.140	+0.04	9.95	-.03	-0.07
7	1310		"	0.150	+0.01	9.89	-.06	-0.07
8	1510		"	0.150	0.0	9.84	-.05	-0.05
9	1710		"	0.120	-.03	9.98	+.14	+0.17
10	0830		8-5-81	0.100	–	9.95	–	–
11	1030		"	0.090	-.01	9.95	0	+0.01
12	1230		"	0.100	+.01	9.93	-.02	-0.03
13	1430		"	0.120	+.02	9.90	-.03	-0.05
14	0930		8/6/81	0.090	–	9.95	–	–
15	1130		"	0.090	0	9.92	-.03	-0.03
16	1330		"	0.105	+.015	9.85	-.07	-0.085
17	1530		"	0.100	+.005	9.84	-0.01	-0.015
18	0900		8/7/81	0.090	–	9.90	–	–
19	1100		"	0.095	+.005	9.87	-.03	-0.035
20	1300		"	0.10	+.005	9.9	+.03	-0.025

Zero Drift = [Mean Zero Drift* 0.005 + CI (Zero) 0.008] ÷ [Span 25%] x 100 = 0.052%.

Calibration Drift = [Mean Span Drift* 0.020 + CI (Span) 0.034] ÷ [Span 25%] x 100 = 0.216%.

*Absolute Value of the mean.

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CO2

MONITOR PERFORMANCE TEST DATA SHEET
ZERO AND CALIBRATION DRIFT (2 HOUR)

Data Set No.	Time		Date	Zero % Reading	Zero Drift (ΔZero)	Span % Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
	Begin	End						
1	1000		8/3/81	0.00	–	12.4	–	–
2	1200		"	0.00	0	12.4	0	0
3	1400		"	0.00	0	12.4	0	0
4	1600		"	0.00	0	12.4	0	0
5	0910		8/4/81	0.00	–	12.4	–	–
6	1110		"	0.00	0	12.46	+0.06	+0.06
7	1310		"	0.00	0	12.40	-.06	-0.06
8	1510		"	0.00	0	12.35	-.05	-0.05
9	1710		"	0.00	0	12.35	0	0
10	0830		8-5-81	0.00	–	12.40	–	–
11	1030		"	0.00	0	12.35	-.05	-0.05
12	1230		"	0.00	0	12.35	0	0
13	1430		"	0.00	0	12.35	0	0
14	0930		8/6/81	0.00	–	12.40	–	–
15	1130		"	0.00	0	12.37	-.03	-0.03
16	1330		"	0.00	0	12.35	-.02	-0.02
17	1530		"	0.00	0	12.31	-.04	-0.04
18	0900		8/7/81	0.00	–	12.4	–	–
19	1100		"	0.00	0	12.39	-.01	-0.01
20	1300		"	0.00	0	12.4	+.01	+0.01

Zero Drift = [Mean Zero Drift* 0.0 + CI (Zero) 0.0] ÷ $\overset{25\%}{\text{[Span]}}$ x 100 = 0.0%.

Calibration Drift = [Mean Span Drift* 0.013 + CI (Span) 0.017] ÷ $\overset{25\%}{\text{[Span]}}$ x 100 = 0.12%.

*Absolute Value of the mean

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

CO.

501.8 ppm gas

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
16:15 7-31-81	0.00	—	501	—
8-1-81	0.00	0.0	501	0.0
16:40 8-2-81	0.00	0.0	501	0.0
1635 8-3-81	0.00	0.0	501	0.0
8-4-81	0.00	0.0	500	-1.0
8-5-81	0.00	0.0	500	-1.0
1615 8-6-81	0.00	0.0	500	-1.0
8/7/81 1615	0.00	0.0	499	-2.0

Zero Drift = [Mean Zero Drift* 0.0 + C.I. (Zero) 0.0]
÷ [Instrument Span 1000 ppm] x 100 = 0.0%.

Calibration Drift = [Mean Span Drift* 0.714 + C.I. (Span) 0.699]
÷ [Instrument Span 1000 ppm] x 100 = 0.14%.

*Absolute Value

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

NO

143 ppm gas

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
16:15 7-31-81	-0.65	—	143	—
8-1-81	0.00	+.65	143	0
16:40 8-2-81	-0.02	-0.02	143	0
1635 8-3-81	0.00	+0.02	143	0
1635 8-4-81	-0.05	-0.05	143	0
1635 8-5-81	-0.05	-0.05	144	+1.
1615 8/6/81	-0.05	-0.05	144	+1
1615 8/7/81	0.00	0.00	141.	-2

Zero Drift = [Mean Zero Drift* 0.071 + C.I. (Zero) 0.237]
÷ [Instrument Span 250 ppm] x 100 = 0.12%.

Calibration Drift = [Mean Span Drift* 0.0 + C.I. (Span) 0.925]
÷ [Instrument Span 250 ppm] x 100 = 0.37%.

*Absolute Value of the mean

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

O_2 10.03 % gas

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
16:15 7-31-81	0.09	—	9.58	—
8-1-81	0.09	0	9.60	+.02
6:40 8-2-81	0.095	+0.005	10.05	+0.45
1635 8-3-81	0.100	+0.005	9.98	-0.07
8-4-81	0.130	+.030	9.89	-0.09
8-5-81	0.092	-0.038	9.80	-0.09
8/6/81	0.100	+.008	9.79	-0.01
8/7/81 1615	0.150	+0.05	9.85	+0.06

Zero Drift = [Mean Zero Drift* 0.009 + C.I. (Zero) 0.025]
÷ [Instrument Span] x 100 = 0.14%.
25%

Calibration Drift = [Mean Span Drift* 0.039 + C.I. (Span) 0.176]
÷ [Instrument Span] x 100 = 0.86%.
25%

*Absolute Value of the mean

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

CO$_2$ 12.40% gas

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
1615 7-31-81	0.00	—	12.35 (spanned at 12.35)	—
8-1-81	0.00	0.0	12.30 "	-.05
16:40 8-2-81	0.00	0.0	12.23 "	-0.07
1635 8-3-81	0.00	0.0	12.35 "	+ .12
1630 8-4-81	0.00	0.0	12.38 (spanned at 12.40)	+ .03
1615 8-5-81	0.00	0.0	12.35 "	-.05
1615 8-6-81	0.00	0.0	12.32 "	-.08
8/7/81 1615	0.00	0.0	12.35 "	-.05

Zero Drift = [Mean Zero Drift* 0.0 + C.I. (Zero) 0.0]
÷ [Instrument Span] 25% x 100 = 0.0%.

Calibration Drift = [Mean Span Drift* 0.021 + C.I. (Span) 0.066]
÷ [Instrument Span] 25% x 100 = 0.35%.

*Absolute Value of the mean

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Figure B-8.

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MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

O2 Inst.

Calibration Gas Mixture Data

Mid (50%) 10.03 % ~~ppm~~ High (90%) 19.15 % ~~ppm~~

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences[1], ppm
1 O	0	0.15	−0.15
2 M	10.03 %	9.89	+0.14
3 O	0	0.15	−0.15
4 H	19.15	19.00	+0.15
5 M	10.03	9.85	+0.18
6 H	19.15	19.10	+0.05
7 M	10.03	9.84	+0.19
8 O	0	0.18	−0.18
9 H	19.15	19.00	+0.15
10 O	0	.16	−0.16
11 M	10.03	9.87	+0.16
12 H	19.15	18.98	+0.17
13 O	0	.15	−0.15
14 H	19.15	18.95	+0.20
15 M	10.03	9.89	+0.14

	Mid	High
Mean difference	0.162	0.144
Confidence interval	+0.028	+0.070
Calibration error = $\frac{\text{Mean Difference}^{2} + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	1.89 %	1.12 %

---

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Figure B-8.

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MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

CO2 Inst.

Calibration Gas Mixture Data

Mid (50%) 12.4 ~~ppm~~ %   High (90%) 21.86 ~~ppm~~ %

Run #	Calibration Gas Concentration, ~~ppm~~ %	Measurement System Reading, ~~ppm~~ %	Differences,[1] ~~ppm~~ %
1 O	0	0.00	0.00
2 M	12.40%	12.4	0.00
3 O	0	0.00	0.00
4 H	21.86	22.0	-0.14
5 M	12.40	12.35	+0.05
6 H	21.86	21.88	-0.02
7 M	12.40	12.34	+0.06
8 O	0	0.00	0.00
9 H	21.86	21.86	0.00
10 O	0	0.00	0.00
11 M	12.40	12.35	+0.05
12 H	21.86	21.80	+0.06
13 O	0	0.00	0.00
14 H	21.86	21.80	+0.06
15 M	12.40	12.34	+0.06

	Mid	High
Mean difference	0.044	0.056
Confidence interval	+0.031	+0.067
Calibration error = $\frac{\text{Mean Difference}^{2} + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	0.60 %	0.56 %

---

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Figure B-8.

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MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

CO Inst.

Calibration Gas Mixture Data

Mid (50%) 501 ppm High (90%) 870. ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences,[1] ppm
1 O	0	0.00	0.0
2 M	501	501	0.0
3 O	0	0.00	0.0
4 H	870	869	+1.0
5 M	501	500	+1.0
6 H	870	868	+2.0
7 M	501	499	+2.0
8 O	0	0.00	0.0
9 H	870	868	+2.0
10 O	0	0.00	0.0
11 M	501	500	+1.0
12 H	870	870	0.0
13 O	0	0.00	0.0
14 H	870	871	-1.0
15 M	501	498	+3.0

	Mid	High
Mean difference	1.40	1.20
Confidence interval	+1.42	+1.04
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	0.56 %	0.26 %

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[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Figure B-8.

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MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

NO Inst.

Calibration Gas Mixture Data

Mid (50%) 143 ppm High (90%) 221 ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences,[1] ppm
1 O	0	0.00	0.0
2 M	143	143	0.0
3 O	0	0.00	0.0
4 H	221	219	+3.0
5 M	143	144	-1.0
6 H	221	222	-1.0
7 M	143	144	-1.0
8 O	0	0.00	0.0
9 H	221	222	-1.0
10 O	0	0.00	0.0
11 M	143	142	+1.0
12 H	221	219	+2.0
13 O	0	0.1	-0.1
14 H	221	222.	-1.0
15 M	143	141	+2.0

	Mid	High
Mean difference	1.00	1.60
Confidence interval	±0.88	±1.11
Calibration error = $\frac{\text{Mean Difference}^{2} + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	1.31%	1.23%

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[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

CO

Date of Test 8/6/81

Span Gas Concentration 501 **ppm**

Analyzer Span Setting 501 **ppm**

Upscale

1 51.6 seconds

2 55. seconds

3 52.5 seconds

Average upscale response 53.0 seconds

Downscale

1 52.1 seconds

2 46.4 seconds

3 47. seconds

Average downscale response 48.5 seconds.

System average response time (slower time) = 53.0 seconds.

% deviation from slower system average response $= \left[\dfrac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% =$ 8.49.

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MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

O2 Inst.

Date of Test 8/6/81

Span Gas Concentration 10.04 % ~~ppm~~

Analyzer Span Setting 9.9 % ~~ppm~~

Upscale

1 53.2 seconds

2 47.5 seconds

3 52. seconds

Average upscale response 50.9 seconds

Downscale

1 49. seconds

2 45.7 seconds

3 47.5 seconds

Average downscale response 47.4 seconds.

System average response time (slower time) = 50.9 seconds.

% deviation from slower system average response $= \left[\dfrac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% =$ 6.88.

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MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

NO Inst. 143 ppm NO Span Gas

Date of Test 8/6/81

Span Gas Concentration 143 **ppm**

Analyzer Span Setting 143 **ppm**

Upscale	**1**	51.6 **seconds**
	2	53.1 **seconds**
	3	50.3 **seconds**

Average upscale response 51.7 **seconds**

Downscale	**1**	46. **seconds**
	2	44.6 **seconds**
	3	47.3 **seconds**

Average downscale response 46.0 **seconds.**

System average response time (slower time) = 51.7 **seconds.**

$$\text{\% deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = 11.03.$$

Data Sheet 6017-35
40CFR60/App. B
7/1/77

KVB

Engineer Gabriel

MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

CO_2 Inst.

Date of Test 8/6/81

Span Gas Concentration 12.4 % ~~ppm~~

Analyzer Span Setting 12.4 % ~~ppm~~

Upscale

1 54. seconds
2 53.2 seconds
3 50.7 seconds

Average upscale response 52.6 seconds

Downscale

1 50.1 seconds
2 47. seconds
3 48.6 seconds

Average downscale response 48.6 seconds.

System average response time (slower time) = 52.6 seconds.

% deviation from slower system average response = $\left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right]$ x 100% = 7.60.

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APPENDIX B

CONTINUOUS MONITOR PERFORMANCE SPECIFICATIONS

APPENDIX B—PERFORMANCE SPECIFICATIONS

Performance Specification 1—Performance specifications and specification test procedures for transmissometer systems for continuous measurement of the opacity of stack emissions.

1. Principle and Applicability.

1.1 Principle. The opacity of particulate matter in stack emissions is measured by a continuously operating emission measurement system. These systems are based upon the principle of transmissometry which is a direct measurement of the attenuation of visible radiation (opacity) by particulate matter in a stack effluent. Light having specific spectral characteristics is projected from a lamp across the stack of a pollutant source to a light sensor. The light is attenuated due to absorption and scatter by the particulate matter in the effluent. The percentage of visible light attenuated is defined as the opacity of the emission. Transparent stack emissions that do not attenuate light will have a transmittance of 100 or an opacity of 0. Opaque stack emissions that attenuate all of the visible light will have a transmittance of 0 or an opacity of 100 percent. The transmissometer is evaluated by use of neutral density filters to determine the precision of the continuous monitoring system. Tests of the system are performed to determine zero drift, calibration drift, and response time characteristics of the system.

1.2 Applicability. This performance specification is applicable to the continuous monitoring systems specified in the subparts for measuring opacity of emissions. Specifications for continuous measurement of visible emissions are given in terms of design, performance, and installation parameters. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems subject to approval by the Administrator.

2. Apparatus.

2.1 Calibrated Filters. Optical filters with neutral spectral characteristics and known optical densities to visible light or screens known to produce specified optical densities. Calibrated filters with accuracies certified by the manufacturer to within ±3 percent opacity shall be used. Filters required are low, mid, and high-range filters with nominal optical densities as follows when the transmissometer is spanned at opacity levels specified by applicable subparts:

Span value (percent opacity)	Calibrated filter optical densities with equivalent opacity in parenthesis		
	Low-range	Mid-range	High-range
50	0.1 (20)	0.2 (37)	0.3 (50)
60	.1 (20)	.2 (37)	.3 (50)
70	.1 (20)	.3 (50)	.4 (60)
80	.1 (20)	.3 (50)	.6 (75)
90	.1 (20)	.4 (60)	.7 (80)
100	.1 (20)	.4 (60)	.9 (87½)

It is recommended that filter calibrations be checked with a well-collimated photopic transmissometer of known linearity prior to use. The filters shall be of sufficient size to attenuate the entire light beam of the transmissometer.

2.2 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with the analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

2.3 Opacity measurement System. An in-stack transmissometer (folded or single path) with the optical design specifications designated below, associated control units and apparatus to keep optical surfaces clean.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of pollutant opacity in a source effluent. Continuous monitoring systems consist of major subsystems as follows:

3.1.1 Sampling Interface. The portion of a continuous monitoring system for opacity that protects the analyzer from the effluent.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant and generates a signal output that is a function of the pollutant opacity.

3.1.3 Data Recorder. That portion of the continuous monitoring system that processes the analyzer output and provides a permanent record of the output signal in terms of pollutant opacity.

3.2 Transmissometer. The portions of a continuous monitoring system for opacity that include the sampling interface and the analyzer.

3.3 Span. The value of opacity at which the continuous monitoring system is set to produce the maximum data display output. The span shall be set at an opacity specified in each applicable subpart.

3.4 Calibration Error. The difference between the opacity reading indicated by the continuous monitoring system and the known values of a series of test standards. For this method the test standards are a series of calibrated optical filters or screens.

3.5 Zero Drift. The change in continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time of the measurements is zero.

3.6 Calibration Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time of the measurements is the same known upscale value.

3.7 System Response. The time interval from a step change in opacity in the stack at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is reached as displayed on the continuous monitoring system data recorder.

3.8 Operational Test Period. A minimum period of time over which a continuous monitoring system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.9 Transmittance. The fraction of incident light that is transmitted through an optical medium of interest.

3.10 Opacity. The fraction of incident light that is attenuated by an optical medium of interest. Opacity (O) and transmittance (T) are related as follows:

$$O=1-T$$

3.11 Optical Density. A logarithmic measure of the amount of light that it attenuated by an optical medium of interest. Optical density (D) is related to the transmittance and opacity as follows:

$D=-\log_{10}T$

$D=-\log_{10}(1-O)$

3.12 Peak Optical Response. The wavelength of maximum sensitivity of the instrument.

3.13 Mean Spectral Response. The wavelength which bisects the total area under the curve obtained pursuant to paragraph 9.2.1.

3.14 Angle of View. The maximum (total) angle of radiation detection by the photodetector assembly of the analyzer.

3.15 Angle of Projection. The maximum (total) angle that contains 95 percent of the radiation projected from the lamp assembly of the analyzer.

3.16 Pathlength. The depth of effluent in the light beam between the receiver and the transmitter of the single-pass transmissometer, or the depth of effluent between the transceiver and reflector of a double-pass transmissometer. Two pathlengths are referenced by this specification:

3.16.1 Monitor Pathlength. The depth of effluent at the installed location of the continuous monitoring system.

3.16.2 Emission Outlet Pathlength. The depth of effluent at the location emissions are released to the atmosphere.

4. Installation Specification.

4.1 Location. The transmissometer must be located across a section of duct or stack that will provide a particulate matter flow through the optical volume of the transmissometer that is representative of the particulate matter flow through the duct or stack. It is recommended that the monitor pathlength or depth of effluent for the transmissometer include the entire diameter of the duct or stack. In installations using a shorter pathlength, extra caution must be used in determining the measurement location representative of the particulate matter flow through the duct or stack.

4.1.1 The transmissometer location shall be downstream from all particulate control equipment.

4.1.2 The transmissometer shall be located as far from bends and obstructions as practical.

4.1.3 A transmissometer that is located in the duct or stack following a bend shall be installed in the plane defined by the bend where possible.

4.1.4 The transmissometer should be installed in an accessible location.

4.1.5 When required by the Administrator, the owner or operator of a source must demonstrate that the transmissometer is located in a section of duct or stack where a representative particulate matter distribution exists. The determination shall be accomplished by examining the opacity profile of the effluent at a series of positions across the duct or stack while the plant is in operation at maximum or reduced operating rates or by other tests acceptable to the Administrator.

4.2 Slotted Tube. Installations that require the use of a slotted tube shall use a slotted tube of sufficient size and blackness so as not to interfere with the free flow of effluent through the entire optical volume of the transmissometer or reflect light into the transmissometer photodetector. Light reflections may be prevented by using blackened baffles within the slotted tube to prevent the lamp radiation from impinging upon the tube walls, by restricting the angle of projection of the light and the angle of view of the photodetector assembly to less than the cross-sectional area of the slotted tube, or by other methods. The owner or operator must show that the manufacturer of the monitoring system has used appropriate methods to minimize light reflections for systems using slotted tubes.

4.3 Data Recorder Output. The continuous monitoring system output shall permit expanded display of the span opacity on a standard 0 to 100 percent scale. Since all opacity standards are based on the opacity of the effluent exhausted to the atmosphere, the system output shall be based upon the emission outlet pathlength and permanently recorded. For affected facilities whose monitor pathlength is different from the facility's emission outlet pathlength, a graph shall be provided with the installation to show the relationships between the continuous monitoring system recorded opacity based upon the emission outlet pathlength and the opacity of the effluent at the analyzer location (monitor pathlength). Tests for measurement of opacity that are required by this performance specification are based upon the monitor pathlength. The graph necessary to convert the data recorder output to the monitor pathlength basis shall be established as follows:

$$\log (1-0_1)=(1_1/1_2) \log (1-0_2)$$

where:

0_1=the opacity of the effluent based upon 1_1.
0_2=the opacity of the effluent based upon 1_2.
1_1=the emission outlet pathlength.
1_2=the monitor pathlength.

5. Optical Design Specifications.

The optical design specifications set forth in Section 6.1 shall be met in order for a measurement system to comply with the requirements of this method.

6. Determination of Conformance with Design Specifications.

6.1 The continuous monitoring system for measurement of opacity shall be demonstrated to conform to the design specifications set forth as follows:

6.1.1 Peak Spectral Response. The peak spectral response of the continuous monitoring systems shall occur between 500 nm and 600 nm. Response at any wavelength below 400 nm or above 700 nm shall be less than 10 percent of the peak response of the continuous monitoring system.

6.1.2 Mean Spectral Response. The mean spectral response of the continuous monitoring system shall occur between 500 nm and 600 nm.

6.1.3 Angle of View. The total angle of view shall be no greater than 5 degrees.

6.1.4 Angle of Projection. The total angle of projection shall be no greater than 5 degrees.

6.2 Conformance with the requirements of section 6.1 may be demonstrated by the owner or operator of the affected facility by testing each analyzer or by obtaining a certificate of conformance from the instrument manufacturer. The certificate must certify that at least one analyzer from each month's production was tested and satisfactorily met all applicable requirements. The certificate must state that the first analyzer randomly sampled met all requirements of paragraph 6 of this specification. If any of the requirements were not met, the certificate must show that the entire month's analyzer production was resampled according to the military standard 105D sampling procedure (MIL-STD-105D) inspection level II; was retested for each of the applicable requirements under paragraph 6 of this specification; and was determined to be acceptable under MIL-STD-105D procedures. The certificate of conformance must show the results of each test performed for the analyzers sampled during the month the analyzer being installed was produced.

6.3 The general test procedures to be followed to demonstrate conformance with Section 6 requirements are given as follows: (These procedures will not be applicable to all designs and will require modification in some cases. Where analyzer and optical design is certified by the manufacturer to conform with the angle of view or angle of projection specifications, the respective procedures may be omitted.)

6.3.1 Spectral Response. Obtain spectral data for detector, lamp, and filter components used in the measurement system from their respective manufacturers.

6.3.2 Angle of View. Set the receiver up as specified by the manufacturer. Draw an arc with radius of 3 meters. Measure the receiver response to a small (less than 3 centimeters) non-directional light source at 5-centimeter intervals on the arc for 26 centimeters on either side of the detector centerline. Repeat the test in the vertical direction.

6.3.3 Angle of Projection. Set the projector up as specified by the manufacturer. Draw an arc with radius of 3 meters. Using a small photoelectric light detector (less than 3 centimeters), measure the light intensity at 5-centimeter intervals on the arc for 26 centimeters on either side of the light source centerline of projection. Repeat the test in the vertical direction.

7. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 1-1 to be considered acceptable under this method.

TABLE 1-1.—*Performance specifications*

Parameter	*Specifications*
a. Calibration error	$\leq$3 pct opacity.[1]
b. Zero drift (24 h)	$\leq$2 pct opacity.[1]
c. Calibration drift (24 h)	$\leq$2 pct opacity.[1]
d. Response time	10 s (maximum).
e. Operational test period	168 h.

[1] Expressed as sum of absolute mean value and the 95 pct confidence interval of a series of tests.

8. Performance Specification Test Procedures. The following test procedures shall be used to determine conformance with the requirements of paragraph 7:

8.1 Calibration Error and Response Time Test. These tests are to be performed prior to installation of the system on the stack and may be performed at the affected facility or at other locations provided that proper notification is given. Set up and calibrate the measurement system as specified by the manufacturer's written instructions for the monitor pathlength to be used in the installation. Span the analyzer as specified in applicable subparts.

8.1.1 Calibration Error Test. Insert a series of calibration filters in the transmissometer path at the midpoint. A minimum of three calibration filters (low, mid, and high-range) selected in accordance with the table under paragraph 2.1 and calibrated within 3 percent must be used. Make a total of five nonconsecutive readings for each filter. Record the measurement system output readings in percent opacity. (See Figure 1–1.)

8.1.2 System Response Test. Insert the high-range filter in the transmissometer path five times and record the time required for the system to respond to 95 percent of final zero and high-range filter values. (See Figure 1–2.)

8.2 Field Test for Zero Drift and Calibration Drift. Install the continuous monitoring system on the affected facility and perform the following alignments:

8.2.1 Preliminary Alignments. As soon as possible after installation and once a year thereafter when the facility is not in operation, perform the following optical and zero alignments:

8.2.1.1 Optical Alignment. Align the light beam from the transmissometer upon the optical surfaces located across the effluent (i.e., the retroflector or photodetector as applicable) in accordance with the manufacturer's instructions.

8.2.1.2 Zero Alignment. After the transmissometer has been optically aligned and the transmissometer mounting is mechanically stable (i.e., no movement of the mounting due to thermal contraction of the stack, duct, etc.) and a clean stack condition has been determined by a steady zero opacity condition, perform the zero alignment. This alignment is performed by balancing the continuous monitor system response so that any simulated zero check coincides with an actual zero check performed across the monitor pathlength of the clean stack.

8.2.1.3 Span. Span the continuous monitoring system at the opacity specified in subparts and offset the zero setting at least 10 percent of span so that negative drift can be quantified.

8.2.2. Final Alignments. After the preliminary alignments have been completed and the affected facility has been started up and reaches normal operating temperature, recheck the optical alignment in accordance with 8.2.1.1 of this specification. If the alignment has shifted, realign the optics, record any detectable shift in the opacity measured by the system that can be attributed to the optical realignment, and notify the Administrator. This condition may not be objectionable if the affected facility operates within a fairly constant and adequately narrow range of operating temperatures that does not produce significant shifts in optical alignment during normal operation of the facility. Under circumstances where the facility operations produce fluctuations in the effluent gas temperature that result in significant misalignments, the Administrator may require improved mounting structures or another location for installation of the transmissometer.

8.2.3 Conditioning Period. After completing the post-startup alignments, operate the system for an initial 168-hour conditioning period in a normal operational manner.

8.2.4 Operational Test Period. After completing the conditioning period, operate the system for an additional 168-hour period retaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed or calibrated. At 24-hour intervals the zero and span shall be checked according to the manufacturer's instructions. Minimum procedures used shall provide a system check of the analyzer internal mirrors and all electronic circuitry including the lamp and photodetector assembly and shall include a procedure for producing a simulated zero opacity condition and a simulated upscale (span) opacity condition as viewed by the receiver. The manufacturer's written instructions may be used providing that they equal or exceed these minimum procedures. Zero and span the transmissometer, clean all optical surfaces exposed to the effluent, realign optics, and make any necessary adjustments to the calibration of the system daily. These zero and calibration adjustments and optical realignments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the measurement system without operator intervention are allowable at any time. The magnitude of any zero or span drift adjustments shall be recorded. During this 168-hour operational test period, record the following at 24-hour intervals: (a) The zero reading and span readings after the system is calibrated (these readings should be set at the same value at the beginning of each 24-hour period); (b) the zero reading after each 24 hours of operation, but before cleaning and adjustment; and (c) the span reading after cleaning and zero adjustment, but before span adjustment. (See Figure 1–3.)

9. Calculation, Data Analysis, and Reporting.

9.1 Procedure for Determination of Mean Values and Confidence Intervals.

9.1.1 The mean value of the data set is calculated according to equation 1-1.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Equation 1-1}$$

where x_i = absolute value of the individual measurements,

Σ = sum of the individual values,

$\bar{x}$ = mean value, and

n = number of data points.

9.1.2 The 95 percent confidence interval (two-sided) is calculated according to equation 1-2:

$$C.I._{95} = \frac{t_{.975}}{n\sqrt{n-1}} \sqrt{n(\sum x_i^2) - (\sum x_i)^2}$$

Equation 1-2

where

$\sum x_i$ = sum of all data points,
$t_{.975} = t_1 - \alpha/2$, and
$C.I._{95}$ = 95 percent confidence interval estimate of the average mean value.

Values for $t_{.975}$

n	$t_{.975}$	n	$t_{.975}$
2	12.706	10	2.262
3	4.303	11	2.228
4	3.182	12	2.201
5	2.776	13	2.179
6	2.671	14	2.160
7	2.447	15	2.145
8	2.365	16	2.131
9	2.306		

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

9.2 Data Analysis and Reporting.

9.2.1 Spectral Response. Combine the spectral data obtained in accordance with paragraph 6.3.1 to develop the effective spectral response curve of the transmissometer. Report the wavelength at which the peak response occurs, the wavelength at which the mean response occurs, and the maximum response at any wavelength below 400 nm and above 700 nm expressed as a percentage of the peak response as required under paragraph 6.2.

9.2.2 Angle of View. Using the data obtained in accordance with paragraph 6.3.2, calculate the response of the receiver as a function of viewing angle in the horizontal and vertical directions (26 centimeters of arc with a radius of 3 meters equal 5 degrees). Report relative angle of view curves as required under paragraph 6.2.

9.2.3 Angle of Projection. Using the data obtained in accordance with paragraph 6.3.3, calculate the response of the photoelectric detector as a function of projection angle in the horizontal and vertical directions. Report relative angle of projection curves as required under paragraph 6.2.

9.2.4 Calibration Error. Using the data from paragraph 8.1 (Figure 1-1), subtract the known filter opacity value from the value shown by the measurement system for each of the 15 readings. Calculate the mean and 95 percent confidence interval of the five different values at each test filter value according to equations 1-1 and 1-2. Report the sum of the absolute mean difference and the 95 percent confidence interval for each of the three test filters.

9.2.5 Zero Drift. Using the zero opacity values measured every 24 hours during the field test (paragraph 8.2), calculate the differences between the zero point after cleaning, aligning, and adjustment, and the zero value 24 hours later just prior to cleaning, aligning, and adjustment. Calculate the mean value of these points and the confidence interval using equations 1-1 and 1-2. Report the sum of the absolute mean value and the 95 percent confidence interval.

9.2.6 Calibration Drift. Using the span value measured every 24 hours during the field test, calculate the differences between the span value after cleaning, aligning, and adjustment of zero and span, and the span value 24 hours later just after cleaning, aligning, and adjustment of zero and before adjustment of span. Calculate the mean value of these points and the confidence interval using equations 1-1 and 1-2. Report the sum of the absolute mean value and the confidence interval.

9.2.7 Response Time. Using the data from paragraph 8.1, calculate the time interval from filter insertion to 95 percent of the final stable value for all upscale and downscale traverses. Report the mean of the 10 upscale and downscale test times.

9.2.8 Operational Test Period. During the 168-hour operational test period, the continuous monitoring system shall not require any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the manufacturer's operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system is operated within the specified performance parameters and does not require corrective maintenance, repair, replacement, or adjustment other than as specified above during the 168-hour test period, the operational test period shall have been successfully concluded. Failure of the continuous monitoring system to meet these requirements shall call for a repetition of the 168-hour test period. Portions of the tests which were satisfactorily completed need not be repeated. Failure to meet any performance specification(s) shall call for a repetition of the one-week operational test period and that specific portion of the tests required by paragraph 8 related to demonstrating compliance with the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

10. References.

10.1 "Experimental Statistics," Department of Commerce, National Bureau of Standards Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

10.2 "Performance Specifications for Stationary-Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.

Calibrated Neutral Density Filter Data
(See paragraph 8.1.1)

Low Range ____% opacity
Mid Range ___% opacity
High Range ___% opacity
Span Value _____% opacity

Date of Test ________________
Location of Test ________________

	Calibrated Filter[1]	Analyzer Reading % Opacity	Differences[2] % Opacity
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Low	Mid	High
Mean difference	____	____	____
Confidence interval	____	____	____
Calibration error = Mean Difference[3] + C.I.	____	____	____

---

[1] Low, mid or high range

[2] Calibration filter opacity - analyzer reading

[3] Absolute value

Figure 1-1. Calibration Error Test

Date of Test__________ Location of Test __________

Span Filter____________________% Opacity

Analyzer Span Setting______________% Opacity

Upscale 1 ____________ seconds
2 ____________ seconds
3 ____________ seconds
4 ____________ seconds
5 ____________ seconds

Downscale 1 ____________ seconds
2 ____________ seconds
3 ____________ seconds
4 ____________ seconds
5 ____________ seconds
Average response __________ seconds

Figure 1-2. Response Time Test

Zero Setting __________ (See paragraph 8.2.1) Date of Test ______________

Span Setting __________

Date and Time	Zero Reading (Before cleaning and adjustment)	Zero Drift (ΔZero)	Span Reading (After cleaning and zero adjustment but before span adjustment)	Calibration Drift (ΔSpan)

Zero Drift = Mean Zero Drift* __________ + CI (Zero) __________ = __________.

Calibration Drift = Mean Span Drift* __________ + CI (Span) __________ = __________.

---

*Absolute value

Figure 1-3. Zero and Calibration Drift Test

PERFORMANCE SPECIFICATION 2—PERFORMANCE SPECIFICATIONS AND SPECIFICATION TEST PROCEDURES FOR MONITORS OF SO_2 AND NO_x FROM STATIONARY SOURCES

1. Principle and Applicability.

1.1 Principle. The concentration of sulfur dioxide or oxides of nitrogen pollutants in stack emissions is measured by a continuously operating emission measurement system. Concurrent with operation of the continuous monitoring system, the pollutant concentrations are also measured with reference methods (Appendix A). An average of the continuous monitoring system data is computed for each reference method testing period and compared to determine the relative accuracy of the continuous monitoring system. Other tests of the continuous monitoring system are also performed to determine calibration error, drift, and response characteristics of the system.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of nitrogen oxides or sulfur dioxide pollutants. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems.

2. Apparatus.

2.1 Calibration Gas Mixtures. Mixtures of known concentrations of pollutant gas in a diluent gas shall be prepared. The pollutant gas shall be sulfur dioxide or the appropriate oxide(s) of nitrogen specified by paragraph 6 and within subparts. For sulfur dioxide gas mixtures, the diluent gas may be air or nitrogen. For nitric oxide (NO) gas mixtures, the diluent gas shall be oxygen-free (<10 ppm) nitrogen, and for nitrogen dioxide (NO_2) gas mixtures the diluent gas shall be air. Concentrations of approximately 50 percent and 90 percent of span are required. The 90 percent gas mixture is used to set and to check the span and is referred to as the span gas.

2.2 Zero Gas. A gas certified by the manufacturer to contain less than 1 ppm of the pollutant gas or ambient air may be used.

2.3 Equipment for measurement of the pollutant gas concentration using the reference method specified in the applicable standard.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

2.5 Continuous monitoring system for SO_2 or NO_x pollutants as applicable.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of a pollutant gas concentration in a source effluent. Continuous monitoring systems consist of major subsystems as follows:

3.1.1 Sampling Interface. That portion of an extractive continuous monitoring system that performs one or more of the following operations: Acquisition, transportation, and conditioning of a sample of the source effluent or that portion of an in-situ continuous monitoring system that protects the analyzer from the effluent.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of pollutant concentration at which the continuous monitoring system is set to produce the maximum data display output. The span shall be set at the concentration specified in each applicable subpart.

3.3 Accuracy (Relative). The degree of correctness with which the continuous monitoring system yields the value of gas concentration of a sample relative to the value given by a defined reference method. This accuracy is expressed in terms of error, which is the difference between the paired concentration measurements expressed as a percentage of the mean reference value.

3.4 Calibration Error. The difference between the pollutant concentration indicated by the continuous monitoring system and the known concentration of the test gas mixture.

3.5 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time for the measurements is zero.

3.6 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operations when the pollutant concentration at the time of the measurements is the same known upscale value.

3.7 Response Time. The time interval from a step change in pollutant concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is reached as displayed on the continuous monitoring system data recorder.

3.8 Operational Period. A minimum period of time over which a measurement system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.9 Stratification. A condition identified by a difference in excess of 10 percent between the average concentration in the duct or stack and the concentration at any point more than 1.0 meter from the duct or stack wall.

4. Installation Specifications. Pollutant continuous monitoring systems (SO_2 and NO_x) shall be installed at a sampling location where measurements can be made which are directly representative (4.1), or which can be corrected so as to be representative (4.2) of the total emissions from the affected

facility. Conformance with this requirement shall be accomplished as follows:

4.1 Effluent gases may be assumed to be nonstratified if a sampling location eight or more stack diameters (equivalent diameters) downstream of any air in-leakage is selected. This assumption and data correction procedures under paragraph 4.2.1 may not be applied to sampling locations upstream of an air preheater in a steam generating facility under Subpart D of this part. For sampling locations where effluent gases are either demonstrated (4.3) or may be assumed to be nonstratified (eight diameters), a point (extractive systems) or path (in-situ systems) of average concentration may be monitored.

4.2 For sampling locations where effluent gases cannot be assumed to be nonstratified (less than eight diameters) or have been shown under paragraph 4.3 to be stratified, results obtained must be consistently representative (e.g. a point of average concentration may shift with load changes) or the data generated by sampling at a point (extractive systems) or across a path (in-situ systems) must be corrected (4.2.1 and 4.2.2) so as to be representative of the total emissions from the affected facility. Conformance with this requirement may be accomplished in either of the following ways:

4.2.1 Installation of a diluent continuous monitoring system (O_2 or CO_2 as applicable) in accordance with the procedures under paragraph 4.2 of Performance Specification 3 of this appendix. If the pollutant and diluent monitoring systems are not of the same type (both extractive or both in-situ), the extractive system must use a multipoint probe.

4.2.2 Installation of extractive pollutant monitoring systems using multipoint sampling probes or in-situ pollutant monitoring systems that sample or view emissions which are consistently representative of the total emissions for the entire cross section. The Administrator may require data to be submitted to demonstrate that the emissions sampled or viewed are consistently representative for several typical facility process operating conditions.

4.3 The owner or operator may perform a traverse to characterize any stratification of effluent gases that might exist in a stack or duct. If no stratification is present, sampling procedures under paragraph 4.1 may be applied even though the eight diameter criteria is not met.

4.4 When single point sampling probes for extractive systems are installed within the stack or duct under paragraphs 4.1 and 4.2.1, the sample may not be extracted at any point less than 1.0 meter from the stack or duct wall. Multipoint sampling probes installed under paragraph 4.2.2 may be located at any points necessary to obtain consistently representative samples.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 2-1 to be considered acceptable under this method.

TABLE 2-1.—*Performance specifications*

Parameter	*Specification*
1. Accuracy [1]	≤20 pct of the mean value of the reference method test data.
2. Calibration error [1]	≤ 5 pct of each (50 pct, 90 pct) calibration gas mixture value.
3. Zero drift (2 h) [1]	2 pct of span
4. Zero drift (24 h) [1]	Do.
5. Calibration drift (2 h) [1]	Do.
6. Calibration drift (24 h) [1]	2.5 pct. of span
7. Response time	15 min maximum.
8. Operational period	168 h minimum.

[1] Expressed as sum of absolute mean value plus 95 pct confidencel nterval of a series of tests.

6. Performance Specification Test Procedures. The following test procedures shall be used to determine conformance with the requirements of paragraph 5. For NO_x analyzers that oxidize nitric oxide (NO) to nitrogen dioxide (NO_2), the response time test under paragraph 6.3 of this method shall be performed using nitric oxide (NO) span gas. Other tests for NO_x continuous monitoring systems under paragraphs 6.1 and 6.2 and all tests for sulfur dioxide systems shall be performed using the pollutant span gas specified by each subpart.

6.1 Calibration Error Test Procedure. Set up and calibrate the complete continuous monitoring system according to the manufacturer's written instructions. This may be accomplished either in the laboratory or in the field.

6.1.1 Calibration Gas Analyses. Triplicate analyses of the gas mixtures shall be performed within two weeks prior to use using Reference Methods 6 for SO_2 and 7 for NO_x. Analyze each calibration gas mixture (50%, 90%) and record the results on the example sheet shown in Figure 2-1. Each sample test result must be within 20 percent of the averaged result or the tests shall be repeated. This step may be omitted for non-extractive monitors where dynamic calibration gas mixtures are not used (6.1.2).

6.1.2 Calibration Error Test Procedure. Make a total of 15 nonconsecutive measurements by alternately using zero gas and each calibration gas mixture concentration (e.g., 0%, 50%, 0%, 90%, 50%, 90%, 50%, 0%, etc.). For nonextractive continuous monitoring systems, this test procedure may be performed by using two or more calibration gas cells whose concentrations are certified by the manufacturer to be functionally equivalent to these gas concentrations. Convert the continuous monitoring system output readings to ppm and record the results on the example sheet shown in Figure 2-2.

6.2 Field Test for Accuracy (Relative), Zero Drift, and Calibration Drift. Install and operate the continuous monitoring system in accordance with the manufacturer's written instructions and drawings as follows:

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of the span so that negative zero drift can be quantified. Operate the system for an initial 168-hour conditioning period in normal operating manner.

6.2.2 Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period retaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.2.1 Field Test for Accuracy (Relative). For continuous monitoring systems employing extractive sampling, the probe tip for the continuous monitoring system and the probe tip for the Reference Method sampling train should be placed at adjacent locations in the duct. For NO_x continuous monitoring systems, make 27 NO_x concentration measurements, divided into nine sets, using the applicable reference method. No more than one set of tests, consisting of three individual measurements, shall be performed in any one hour. All individual measurements of each set shall be performed concurrently, or within a three-minute interval and the results averaged. For SO_2 continuous monitoring systems, make nine SO_2 concentration measurements using the applicable reference method. No more than one measurement shall be performed in any one hour. Record the reference method test data and the continuous monitoring system concentrations on the example data sheet shown in Figure 2-3.

6.2.2.2 Field Test for Zero Drift and Calibration Drift. For extractive systems, determine the values given by zero and span gas pollutant concentrations at two-hour intervals until 15 sets of data are obtained. For nonextractive measurement systems, the zero value may be determined by mechanically producing a zero condition that provides a system check of the analyzer internal mirrors and all electronic circuitry including the radiation source and detector assembly or by inserting three or more calibration gas cells and computing the zero point from the upscale measurements. If this latter technique is used, a graph(s) must be retained by the owner or operator for each measurement system that shows the relationship between the upscale measurements and the zero point. The span of the system shall be checked by using a calibration gas cell certified by the manufacturer to be functionally equivalent to 50 percent of span concentration. Record the zero and span measurements (or the computed zero drift) on the example data sheet shown in Figure 2-4. The two-hour periods over which measurements are conducted need not be consecutive but may not overlap. All measurements required under this paragraph may be conducted concurrent with tests under paragraph 6.2.2.1.

6.2.2.3 Adjustments. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the measurement system without operator intervention or initiation are allowable at any time. During the entire 168-hour operational test period, record on the example sheet shown in Figure 2-5 the values given by zero and span gas pollutant concentrations before and after adjustment at 24-hour intervals.

6.3 Field Test for Response Time.

6.3.1 Scope of Test. Use the entire continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates, pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one pollutant source (stack), repeat this test for each sampling point.

6.3.2 Response Time Test Procedure. Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of pollutant gas. Record the time from concentration switching to 95 percent of final stable response. For non-extractive monitors, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded Perform this test sequence three (3) times Record the results of each test on the example sheet shown in Figure 2-6.

7. Calculations, Data Analysis and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 2-1.

$$\bar{x}=\frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Equation 2-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
$\bar{x}$ = mean value, and
n = number of data points.

7.1.2 The 95 percent confidence interval (two-sided) is calculated according to equation 2-2:

$$C.I._{95}=\frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\Sigma x_i^2)-(\Sigma x_i)^2} \qquad \text{Equation 2-2}$$

where:

$\sum x_i$ = sum of all data points,

$t_{.975} = t_1 - \alpha/2$, and

$C.I._{95}$ = 95 percent confidence interval estimate of the average mean value.

Values for $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Accuracy (Relative). For each of the nine reference method test points, determine the average pollutant concentration reported by the continuous monitoring system. These average concentrations shall be determined from the continuous monitoring system data recorded under 7.2.2 by integrating or averaging the pollutant concentrations over each of the time intervals concurrent with each reference method testing period. Before proceeding to the next step, determine the basis (wet or dry) of the continuous monitoring system data and reference method test data concentrations. If the bases are not consistent, apply a moisture correction to either reference method concentrations or the continuous monitoring system concentrations as appropriate. Determine the correction factor by moisture tests concurrent with the reference method testing periods. Report the moisture test method and the correction procedure employed. For each of the nine test runs determine the difference for each test run by subtracting the respective reference method test concentrations (use average of each set of three measurements for NO_x) from the continuous monitoring system integrated or averaged concentrations. Using these data, compute the mean difference and the 95 percent confidence interval of the differences (equations 2-1 and 2-2). Accuracy is reported as the sum of the absolute value of the mean difference and the 95 percent confidence interval of the differences expressed as a percentage of the mean reference method value. Use the example sheet shown in Figure 2-3.

7.2.2 Calibration Error. Using the data from paragraph 6.1, subtract the measured pollutant concentration determined under paragraph 6.1.1 (Figure 2-1) from the value shown by the continuous monitoring system for each of the five readings at each concentration measured under 6.1.2 (Figure 2-2). Calculate the mean of these difference values and the 95 percent confidence intervals according to equations 2-1 and 2-2. Report the calibration error (the sum of the absolute value of the mean difference and the 95 percent confidence interval) as a percentage of each respective calibration gas concentration. Use example sheet shown in Figure 2-2.

7.2.3 Zero Drift (2-hour). Using the zero concentration values measured each two hours during the field test, calculate the differences between consecutive two-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 2-1 and 2-2. Report the zero drift as the sum of the absolute mean value and the confidence interval as a percentage of span. Use example sheet shown in Figure 2-4.

7.2.4 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 2-1 and 2-2. Report the zero drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use example sheet shown in Figure 2-5.

7.2.5 Calibration Drift (2-hour). Using the calibration values obtained at two-hour intervals during the field test, calculate the differences between consecutive two-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that two-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 2-1 and 2-2. Do not use the differences between non-consecutive readings. Report the calibration drift as the sum of the absolute mean and confidence interval as a percentage of span. Use example sheet shown in in Figure 2-4.

7.2.6 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment, and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate the mean value of these differences and the confidence interval using equations 2-1 and 2-2. Report the calibration drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use the example sheet shown in Figure 2-5.

7.2.7 Response Time. Using the charts from paragraph 6.3, calculate the time interval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower time as the system response time. Use the example sheet shown in Figure 2-6.

7.2.8 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not require any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168-hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the one-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

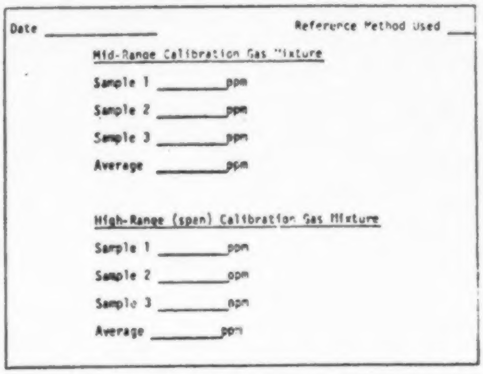
8. References.

8.1 "Monitoring Instrumentation for the Measurement of Sulfur Dioxide in Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., February 1973.

8.2 "Instrumentation for the Determination of Nitrogen Oxides Content of Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., Volume 1, APTD-0847, October 1971; Volume 2, APTD-0942, January 1972.

8.3 "Experimental Statistics," Department of Commerce, Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

8.4 "Performance Specifications for Stationary-Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.



Date ________ Reference Method Used ___

Mid-Range Calibration Gas Mixture

Sample 1 ________ppm

Sample 2 ________ppm

Sample 3 ________ppm

Average ________ppm

High-Range (span) Calibration Gas Mixture

Sample 1 ________ppm

Sample 2 ________ppm

Sample 3 ________ppm

Average ________ppm

Figure 2-1. Analysis of Calibration Gas Mixtures

Calibration Gas Mixture Data (From Figure 2-1)

Mid (50%) _____ ppm High (90%) _____ ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences,[1] ppm
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Mid	High
Mean difference	_____	_____
Confidence interval	± _____	± _____
Calibration error	_____ %	_____ %

$$\text{Calibration error} = \frac{\text{Mean Difference}[2] + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$$

---

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

Figure 2-2. Calibration Error Determination

Test No.	Date and Time	Reference Method Samples					Analyzer 1-Hour Average (ppm)*		Difference (ppm)	
		SO_2 Sample 1 (ppm)	NO_x Sample 1 (ppm)	NO_x Sample 2 (ppm)	NO_x Sample 3 (ppm)	NO_x Sample Average (ppm)	SO_2	NO_x	SO_2	NO_x
1										
2										
3										
4										
5										
6										
7										
8										
9										

Mean reference method test value (SO_2) ______

Mean reference method test value (NO_x) ______

Mean of the differences ______

95% Confidence intervals = ± ______ ppm (SO_2) = ± ______ ppm (NO_x)

Accuracies = $\dfrac{\text{Mean of the differences} + \text{95\% confidence interval}}{\text{Mean reference method value}} \times 100$ = ____% (SO_2) = ____% (NO_x)

* Explain and report method used to determine integrated averages

Figure 2-3. Accuracy Determination (SO_2 and NO_x)

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span- Zero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* ______ + CI (Zero) ______] ÷ [Span] x 100 = ______.

Calibration Drift = [Mean Span Drift* ______ + CI (Span) ______] ÷ [Span] x 100 = ______.

*Absolute Value.

Figure 2-4. Zero and Calibration Drift (2 Hour)

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _______ + C.I. (Zero) _______]

÷ [Instrument Span] x 100 = _________.

Calibration Drift = [Mean Span Drift* _________ + C.I. (Span) _________]

÷ [Instrument Span] x 100 = _________.

* Absolute value

Figure 2-5. Zero and Calibration Drift (24-hour)

Date of Test ______________

Span Gas Concentration _________ppm

Analyzer Span Setting _________ppm

Upscale
1 ________seconds
2 ________seconds
3 ________seconds
Average upscale response ________seconds

Downscale
1 ________seconds
2 ________seconds
3 ________seconds
Average downscale response ______seconds

System average response time (slower time) = _______seconds.

$$\%\text{deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = \_\_\_\_.$$

Figure 2-6. Response Time

Performance Specification 3—Performance specifications and specification test procedures for monitors of CO$_2$ and O$_2$ from stationary sources.

1. Principle and Applicability.

1.1 Principle. Effluent gases are continuously sampled and are analyzed for carbon dioxide or oxygen by a continuous monitoring system. Tests of the system are performed during a minimum operating period to determine zero drift, calibration drift, and response time characteristics.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of carbon dioxide or oxygen. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems subject to approval by the Administrator. Sampling may include either extractive or non-extractive (in-situ) procedures.

2. Apparatus.

2.1 Continuous Monitoring System for Carbon Dioxide or Oxygen.

2.2 Calibration Gas Mixtures. Mixture of known concentrations of carbon dioxide or oxygen in nitrogen or air. Midrange and 90 percent of span carbon dioxide or oxygen concentrations are required. The 90 percent of span gas mixture is to be used to set and check the analyzer span and is referred to as span gas. For oxygen analyzers, if the span is higher than 21 percent O$_2$, ambient air may be used in place of the 90 percent of span calibration gas mixture. Triplicate analyses of the gas mixture (except ambient air) shall be performed within two weeks prior to use using Reference Method 3 of this part.

2.3 Zero Gas. A gas containing less than 100 ppm of carbon dioxide or oxygen.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of carbon dioxide or oxygen in a given source effluent. The system consists of three major subsystems:

3.1.1 Sampling Interface. That portion of the continuous monitoring system that performs one or more of the following operations: Delineation, acquisition, transportation, and conditioning of a sample of the source effluent or protection of the analyzer from the hostile aspects of the sample or source environment.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of oxygen or carbon dioxide concentration at which the continuous monitoring system is set that produces the maximum data display output. For the purposes of this method, the span shall be set no less than 1.5 to 2.5 times the normal carbon dioxide or normal oxygen concentration in the stack gas of the affected facility.

3.3 Midrange. The value of oxygen or carbon dioxide concentration that is representative of the normal conditions in the stack gas of the affected facility at typical operating rates.

3.4 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the carbon dioxide or oxygen concentration at the time for the measurements is zero.

3.5 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operation when the carbon dioxide or oxygen continuous monitoring system is measuring the concentration of span gas.

3.6 Operational Test Period. A minimum period of time over which the continuous monitoring system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.7 Response time. The time interval from a step change in concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is displayed on the continuous monitoring system data recorder.

4. Installation Specification.

Oxygen or carbon dioxide continuous monitoring systems shall be installed at a location where measurements are directly representative of the total effluent from the affected facility or representative of the same effluent sampled by a SO_2 or NO_x continuous monitoring system. This requirement shall be complied with by use of applicable requirements in Performance Specification 2 of this appendix as follows:

4.1 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Not Used to Convert Pollutant Data. A sampling location shall be selected in accordance with the procedures under paragraphs 4.2.1 or 4.2.2, or Performance Specification 2 of this appendix.

4.2 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Used to Convert Pollutant Continuous Monitoring System Data to Units of Applicable Standards. The diluent continuous monitoring system (oxygen or carbon dioxide) shall be installed at a sampling location where measurements that can be made are representative of the effluent gases sampled by the pollutant continuous monitoring system(s). Conformance with this requirement may be accomplished in any of the following ways:

4.2.1 The sampling location for the diluent system shall be near the sampling location for the pollutant continuous monitoring system such that the same approximate point(s) (extractive systems) or path (in-situ systems) in the cross section is sampled or viewed.

4.2.2 The diluent and pollutant continuous monitoring systems may be installed at different locations if the effluent gases at both sampling locations are nonstratified as determined under paragraphs 4.1 or 4.3, Performance Specification 2 of this appendix and there is no in-leakage occurring between the two sampling locations. If the effluent gases are stratified at either location, the procedures under paragraph 4.2.2, Performance Specification 2 of this appendix shall be used for installing continuous monitoring systems at that location.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 3-1 to be considered acceptable under this method.

6. Performance Specification Test Procedures.

The following test procedures shall be used to determine conformance with the requirements of paragraph 4. Due to the wide variation existing in analyzer designs and principles of operation, these procedures are not applicable to all analyzers. Where this occurs, alternative procedures, subject to the approval of the Administrator, may be employed. Any such alternative procedures must fulfill the same purposes (verify response, drift, and accuracy) as the following procedures, and must clearly demonstrate conformance with specifications in Table 3-1.

6.1 Calibration Check. Establish a calibration curve for the continuous monitoring system using zero, midrange, and span concentration gas mixtures. Verify that the resultant curve of analyzer reading compared with the calibration gas value is consistent with the expected response curve as described by the analyzer manufacturer. If the expected response curve is not produced, additional calibration gas measurements shall be made, or additional steps undertaken to verify the accuracy of the response curve of the analyzer.

6.2 Field Test for Zero Drift and Calibration Drift. Install and operate the continuous monitoring system in accordance with the manufacturer's written instructions and drawings as follows:

TABLE 3-1.—*Performance specifications*

Parameter	*Specification*
1. Zero drift (2 h) [1]	$\leq$0.4 pct O_2 or CO_2.
2. Zero drift (24 h) [1]	$\leq$0.5 pct O_2 or CO_2.
3. Calibration drift (2 h) [1]	$\leq$0.4 pct O_2 or CO_2.
4. Calibration drift (24 h) [1]	$\leq$0.5 pct O_2 or CO_2.
5. Operational period	168 h minimum.
6. Response time	10 min.

[1] Expressed as sum of absolute mean value plus 95 pct confidence interval of a series of tests.

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of span so that negative zero drift may be quantified. Operate the continuous monitoring system for an initial 168-hour conditioning period in a normal operational manner.

6.2.2. Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period maintaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.3 Field Test for Zero Drift and Calibration Drift. Determine the values given by zero and midrange gas concentrations at two-hour intervals until 15 sets of data are obtained. For non-extractive continuous monitoring systems, determine the zero value given by a mechanically produced zero condition or by computing the zero value from upscale measurements using calibrated gas cells certified by the manufacturer. The midrange checks shall be performed by using certified calibration gas cells functionally equivalent to less than 50 percent of span. Record these readings on the example sheet shown in Figure 3-1. These two-hour periods need not be consecutive but may not overlap. In-situ CO_2 or O_2 analyzers which cannot be fitted with a calibration gas cell may be calibrated by alternative procedures acceptable to the Administrator. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the continuous monitoring system without operator intervention or initiation are allowable at any time. During the entire 168-hour test period, record the values given by zero and span gas concentrations before and after adjustment at 24-hour intervals in the example sheet shown in Figure 3-2.

6.3 Field Test for Response Time.

6.3.1 Scope of Test.

This test shall be accomplished using the continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates, pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one source (stack), this test shall be repeated for each sampling point.

6.3.2 Response Time Test Procedure.

Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of gas at 90 percent of span. Record the time from concentration switching to 95 percent of final stable response. After the system response has stabilized at the upper level, switch quickly to a zero gas. Record the time from concentration switching to 95 percent of final stable response. Alternatively, for nonextractive continuous monitoring systems, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded. Perform this test sequence three (3) times. For each test, record the results on the data sheet shown in Figure 3-3.

7. Calculations, Data Analysis, and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 3-1.

$$\bar{x}=\frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Equation 3-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
x = mean value, and
n = number of data points.

7.2.1 The 95 percent confidence interval (two-sided) is calculated according to equation 3-2:

$$C.I._{95}=\frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\sum x_i^2)-(\sum x_i)^2} \qquad \text{Equation 3-2}$$

where:

ΣX = sum of all data points,
$t_{.975} = t_1 - \alpha/2$, and
$C.I._{95}$ = 95 percent confidence interval estimates of the average mean value.

Values for $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Zero Drift (2-hour). Using the zero concentration values measured each two hours during the field test, calculate the differences between the consecutive two-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 3-1 and 3-2. Record the sum of the absolute mean value and the confidence interval on the data sheet shown in Figure 3-1.

7.2.2 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 3-1 and 3-2. Record the zero drift (the sum of the absolute mean and confidence interval) on the data sheet shown in Figure 3-2.

7.2.3 Calibration Drift (2-hour). Using the calibration values obtained at two-hour intervals during the field test, calculate the differences between consecutive two-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that two-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 3-1 and 3-2. Do not use the differences between non-consecutive readings. Record the sum of the absolute mean and confidence interval upon the data sheet shown in Figure 3-1.

7.2.4 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate the mean value of these differences and the confidence interval using equations 3-1 and 3-2. Record the sum of the absolute mean and confidence interval on the data sheet shown in Figure 3-2.

7.2.5 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not receive any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the manufacturer's written operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168 hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the one-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

7.2.6 Response Time. Using the data developed under paragraph 5.3, calculate the time interval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower time as the system response time. Record the results on Figure 3-3.

8. References.

8.1 "Performance Specifications for Stationary Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA-650/2-74-013, January 1974.

8.2 "Experimental Statistics," Department of Commerce, National Bureau of Standards Handbook 91, 1963, pp. 3-31, paragraphs 3-3.1.4.

Data Set No.	Time		Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (ΔSpan-ΔZero)
	Begin	End						
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* ________ + CI (Zero) ________] = ________.
Calibration Drift = [Mean Span Drift* ______ + CI (Span ______] = ________.
*Absolute Value.

Figure 3-1. Zero and Calibration Drift (2 Hour).

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _______ + C.I. (Zero) _______]

= _________.

Calibration Drift = [Mean Span Drift* _________ + C.I. (Span) _________]

= __________.

* Absolute value

Figure 3-2. Zero and Calibration Drift (24-hour)

Date of Test ____________

Span Gas Concentration ________ ppm

Analyzer Span Setting ________ ppm

Upscale
1. ________ seconds
2. ________ seconds
3. ________ seconds

Average upscale response ________ seconds

Downscale
1. ________ seconds
2. ________ seconds
3. ________ seconds

Average downscale response ________ seconds

System average response time (slower time) = ________ seconds

% deviation from slower system average response $= \frac{\text{average upscale minus average downscale}}{\text{slower time}} \times 100\%$

= __________.

Figure 3-3. Response

[40 FR 46259, Oct. 6, 1975; 40 FR 59204, 59205, Dec. 22, 1975, as amended at 42 FR 5937, Jan. 31, 1977]

APPENDIX C

TABULATION OF 24-HOUR AND 15-MINUTE DATA

KVB 30-DAY MONITOR TESTING CODES A THRU K

Explanation

Code

A - Testing Begins

B - Testing Ends

C - Instrument Calibrations

D - NO Instrument Out of Service (Maintenance)

E - O_2 Instrument Out of Service (Maintenance)

F - CO_2 Instrument Out of Service (Maintenance)

G - CO Instrument Out of Service (Maintenance)

H - Boiler (Or Unit) Out of Service

I - Continuous Monitor Certification Tests

J - Continuous Monitor Out of Service (Maintenance)

K - Power Failure

Load B/D Load barrels/day

Revised 6/9/81

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*****************************************************************************
**                  PETROLEUM PROCESS HEATER, LOW NOX BURNERS               **
**                              24 HOUR DATA                                **
**                      DRY STACK GAS CONCENTRATION                         **
**                         O2     CO2     CO     NO     CO     NO    CO    NO **
**                 LOAD   VOL%   VOL%   PPMV   PPMV   PPMV   PPMV  NG/J  NG/J **
**   DATE           B/D   MEAS   MEAS   MEAS   MEAS   3%O2   3%O2           **
*****************************************************************************
** 7/31/81       7920.0    3.1   10.2     11     79     11     79     3    43 **
** 8/ 1/81       7920.0    3.8    9.5      7     80      7     83     2    45 **
** 8/ 2/81       7920.0    4.0    9.3      8     79      8     83     2    45 **
** 8/ 3/81       7920.0    4.7    9.1      7     77      7     85     2    46 **
** 8/ 4/81       7755.0    3.5    9.5      7     80      7     82     2    44 **
** 8/ 5/81       8580.0    3.8    9.4      8     81      8     84     2    46 **
** 8/ 6/81       8580.0    4.0    9.2      6     80      6     84     2    45 **
** 8/ 7/81       8580.0    3.3   10.0      6     79      6     80     2    43 **
** 8/ 8/81       8580.0    4.2    9.3      5     78      5     83     1    45 **
** 8/21/81       6550.0   10.6    5.1     48     41     83     71    27    38 **
** 8/22/81       6550.0    7.8    7.1      6     60      8     82     2    44 **
** 8/23/81       6700.0    6.3    7.9      6     68      7     83     2    45 **
** 8/24/81       7150.0    7.1    7.5      8     69     10     89     3    48 **
** 8/25/81       7150.0    7.1    8.0     11     69     14     89     4    48 **
** 8/26/81       6411.4    6.6    8.1      5     71      6     88     2    48 **
** 8/27/81       6524.8    6.7    8.1      5     69      6     86     2    47 **
** 8/28/81       7531.5    6.9    7.9      7     68      8     87     2    47 **
** 8/29/81       8638.2    5.4    8.9      6     71      6     82     2    44 **
** 8/30/81       8290.0    4.2    9.6     22     72     23     77     7    41 **
** 8/31/81       8290.0    4.5    9.3     13     72     14     78     4    42 **
** 9/ 1/81       8425.5    5.2    8.7      7     69      7     78     2    42 **
** 9/ 2/81       8500.0    4.7    9.6     49     84     53     92    17    50 **
** 9/ 3/81       7546.8    5.3   10.4      6     78      6     89     2    48 **
** 9/10/81       6990.5    5.8    9.0     18     68     21     80     7    43 **
** 9/11/81       7000.0    7.5    7.9     21     62     28     82     9    44 **
** 9/12/81       7000.0    8.5    7.3     30     51     43     73    14    39 **
** 9/14/81       7000.0    7.4    7.9     12     64     15     84     5    46 **
** 9/15/81       7000.0    6.2    8.8     15     69     18     84     6    45 **
** 9/16/81       7000.0    5.8    9.0     16     74     19     87     6    47 **
** 9/17/81       6892.3    6.3    8.8     15     73     18     89     6    48 **
** 9/18/81       6849.5    6.9    7.7     12     68     15     87     5    47 **
** 9/19/81       6935.3    6.7    8.6     16     71     20     89     6    48 **
** 9/20/81       7000.0    6.4    8.7     17     69     20     85     6    46 **
*****************************************************************************
```

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**************************************************************************************************************
**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                                       **
**                                       15 MIN. DATA                                                       **
**                               DRY STACK GAS CONCENTRATION                                                **
**                                  O2      CO2     CO      NO      CO      NO      CO      NO    ACODE     **
**                          LOAD    VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J            **
**    DATE      TIME        B/O     MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                            **
**************************************************************************************************************
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
** 0/ 0/ 0        0          .0      .0      .0      0       0       0       0       0       0              **
**************************************************************************************************************
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****************************************************************************************************
**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                             **
**                                       15 MIN. DATA                                             **
**                              DRY STACK GAS CONCENTRATION                                       **
**                               O2     CO2     CO     NO     CO     NO     CO     NO   ACODE     **
**                      LOAD    VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J            **
**   DATE     TIME      B/D     MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                           **
****************************************************************************************************
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 0/ 0/ 0       0       .0      .0     .0      0      0      0      0      0      0              **
** 7/31/81    1700   7920.0     4.4   10.4     25     67     27     72      8     39    A         **
** 7/31/81    1715   7920.0     2.4   10.6     12     80     11     77      3     41              **
** 7/31/81    1730   7920.0     2.6   10.3     10     80      9     78      3     42              **
** 7/31/81    1745   7920.0     3.0   10.2     10     77     10     77      3     41              **
** 7/31/81    1800   7920.0     4.2    9.5      9     77      9     82      3     44              **
** 7/31/81    1815   7920.0     4.3    9.4      9     76      9     81      3     44              **
** 7/31/81    1830   7920.0     4.0    9.6      9     75      9     79      3     43              **
** 7/31/81    1845   7920.0     2.7   10.3     10     72      9     70      3     38              **
** 7/31/81    1900   7920.0     2.3   10.2     10     74      9     71      3     38              **
** 7/31/81    1915   7920.0     3.2    9.9      9     70      9     70      2     38              **
** 7/31/81    1930   7920.0     3.3    9.7      9     67      9     68      3     36              **
** 7/31/81    1945   7920.0     3.7    9.3      9     66      9     68      3     37              **
** 7/31/81    2000   7920.0     3.6    9.0     10     65     10     67      3     36              **
** 7/31/81    2015   7920.0     3.5    9.7     10     73     10     75      3     40              **
** 7/31/81    2030   7920.0     3.5   10.0     11     80     11     82      3     44              **
** 7/31/81    2045   7920.0     2.8   10.3     11     82     10     81      3     43              **
** 7/31/81    2100   7920.0     3.3   10.1     12     85     12     86      4     46              **
** 7/31/81    2115   7920.0     2.9   10.5     11     87     10     86      3     46              **
** 7/31/81    2130   7920.0     3.1   10.3     13     86     13     86      4     46              **
** 7/31/81    2145   7920.0     3.0   10.4     12     86     12     86      3     46              **
** 7/31/81    2200   7920.0     2.8   10.5     12     86     11     85      3     46              **
** 7/31/81    2215   7920.0     2.9   10.4     12     86     11     85      3     46              **
** 7/31/81    2230   7920.0     3.3   10.3     13     87     13     88      4     48              **
** 7/31/81    2245   7920.0     3.5   10.2     13     87     13     89      4     48              **
** 7/31/81    2300   7920.0     3.0   10.4     13     87     13     87      4     47              **
** 7/31/81    2315   7920.0     2.8   10.6     13     87     12     86      4     46              **
** 7/31/81    2330   7920.0     2.0   11.0     13     86     12     81      4     44              **
** 7/31/81    2345   7920.0     2.1   11.0     13     87     12     82      4     44              **
** 7/31/81    2400   7920.0     2.2   10.9     13     88     12     84      4     45              **
****************************************************************************************************
```

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 1/81	15	7920.0	3.2	10.3	13	88	13	88	4	48	
8/ 1/81	30	7920.0	3.5	10.1	13	88	13	90	4	49	
8/ 1/81	45	.0	.0	.0	0	0	0	0	0	0	C
8/ 1/81	100	7920.0	3.6	9.9	6	83	6	85	2	46	
8/ 1/81	115	7920.0	3.5	9.9	7	83	7	85	2	46	
8/ 1/81	130	7920.0	3.8	9.8	6	83	6	86	2	47	
8/ 1/81	145	7920.0	3.6	9.9	7	85	7	87	2	47	
8/ 1/81	200	7920.0	3.4	10.1	7	85	7	86	2	47	
8/ 1/81	215	7920.0	2.9	10.3	7	85	6	84	2	45	
8/ 1/81	230	7920.0	2.9	10.3	6	84	5	83	1	45	
8/ 1/81	245	7920.0	3.2	10.0	6	85	6	85	1	46	
8/ 1/81	300	7920.0	3.6	9.9	6	85	6	87	2	47	
8/ 1/81	315	7920.0	3.2	10.2	6	85	6	85	1	46	
8/ 1/81	330	7920.0	3.4	10.0	6	84	6	85	2	46	
8/ 1/81	345	7920.0	3.0	10.3	6	84	6	84	1	45	
8/ 1/81	400	7920.0	3.1	10.2	6	84	6	84	1	45	
8/ 1/81	415	7920.0	3.4	10.0	6	84	6	85	2	46	
8/ 1/81	430	7920.0	3.9	9.7	5	83	5	87	1	47	
8/ 1/81	445	7920.0	3.5	10.0	5	84	5	86	1	46	
8/ 1/81	500	7920.0	3.6	10.0	6	84	6	86	2	47	
8/ 1/81	515	7920.0	3.5	10.0	5	84	5	86	1	46	
8/ 1/81	530	7920.0	2.9	10.3	8	83	7	82	2	44	
8/ 1/81	545	7920.0	3.7	9.9	5	84	5	87	1	47	
8/ 1/81	600	7920.0	4.1	9.6	5	83	5	88	1	47	
8/ 1/81	615	7920.0	4.0	9.6	5	83	5	87	1	47	
8/ 1/81	630	7920.0	3.8	9.8	4	83	4	86	1	47	
8/ 1/81	645	7920.0	3.7	9.8	4	83	4	86	1	46	
8/ 1/81	700	7920.0	4.0	9.7	4	83	4	87	1	47	
8/ 1/81	715	7920.0	3.9	9.7	4	83	4	87	1	47	
8/ 1/81	730	7920.0	4.2	9.5	4	82	4	87	1	47	
8/ 1/81	745	7920.0	4.2	9.6	4	82	4	87	1	47	
8/ 1/81	800	7920.0	4.4	9.4	4	82	4	88	1	48	
8/ 1/81	815	.0	.0	.0	0	0	0	0	0	0	C
8/ 1/81	830	.0	.0	.0	0	0	0	0	0	0	C
8/ 1/81	845	7920.0	4.8	9.2	21	69	23	76	7	41	
8/ 1/81	900	7920.0	5.6	8.6	8	78	9	91	3	49	
8/ 1/81	915	7920.0	6.2	8.3	7	76	8	92	2	50	
8/ 1/81	930	7920.0	6.2	8.3	7	77	8	93	2	50	
8/ 1/81	945	7920.0	5.0	9.1	8	82	9	92	2	50	
8/ 1/81	1000	7920.0	5.1	9.0	7	82	7	92	2	50	
8/ 1/81	1015	7920.0	4.9	9.1	7	82	7	91	2	49	
8/ 1/81	1030	7920.0	5.0	9.0	7	82	7	92	2	50	
8/ 1/81	1045	7920.0	4.2	9.6	8	84	8	90	2	48	
8/ 1/81	1100	7920.0	4.4	9.4	8	82	8	88	2	48	
8/ 1/81	1115	7920.0	4.7	9.2	6	81	6	89	2	48	
8/ 1/81	1130	7920.0	4.7	9.2	7	82	7	90	2	49	
8/ 1/81	1145	7920.0	4.8	9.1	7	79	7	87	2	47	
8/ 1/81	1200	7920.0	4.5	9.3	7	78	7	85	2	46	

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**********************************************************************************************
**                       PETROLEUM PROCESS HEATER, LOW NOX BURNERS                          **
**                                     15 MIN. DATA                                         **
**                              DRY STACK GAS CONCENTRATION                                 **
**                            O2     CO2     CO      NO      CO      NO      CO     NO  ACODE **
**                   LOAD    VOL%    VOL%   PPMV    PPMV    PPMV    PPMV    NG/J   NG/J     **
**   DATE   TIME      B/D    MEAS    MEAS   MEAS    MEAS    3%O2    3%O2                    **
**********************************************************************************************
** 8/ 1/81  1215  7920.0     4.4     8.8      7      70       7      75       2     41      **
** 8/ 1/81  1230  7920.0     4.0     8.7      6      68       6      72       2     39      **
** 8/ 1/81  1245  7920.0     3.9     8.5      5      67       5      70       1     38      **
** 8/ 1/81  1300  7920.0     3.7     8.6      6      67       6      69       2     37      **
** 8/ 1/81  1315  7920.0     4.0     8.3      6      66       6      69       2     37      **
** 8/ 1/81  1330  7920.0     4.0     8.3      5      65       5      68       1     37      **
** 8/ 1/81  1345  7920.0     3.3     8.6      5      65       5      66       1     35      **
** 8/ 1/81  1400  7920.0     2.9     8.8      6      66       5      65       1     35      **
** 8/ 1/81  1415  7920.0     3.3     8.5      6      66       6      67       2     36      **
** 8/ 1/81  1430  7920.0     3.4     8.4      6      65       6      66       2     36      **
** 8/ 1/81  1445  7920.0     3.5     8.3      6      65       6      66       2     36      **
** 8/ 1/81  1500  7920.0     3.6     8.3      6      65       6      67       2     36      **
** 8/ 1/81  1515  7920.0     3.6     8.4      6      66       6      68       2     37      **
** 8/ 1/81  1530  7920.0     3.5     8.4      6      66       6      67       2     36      **
** 8/ 1/81  1545  7920.0     3.4     8.0      6      66       6      67       2     36      **
** 8/ 1/81  1600  7920.0     3.9     8.0      5      65       5      68       1     37      **
** 8/ 1/81  1615  7920.0     3.9     8.0      5      64       5      67       1     36      **
** 8/ 1/81  1630      .0      .0      .0      0       0       0       0       0      0   C  **
** 8/ 1/81  1645      .0      .0      .0      0       0       0       0       0      0   C  **
** 8/ 1/81  1700      .0      .0      .0      0       0       0       0       0      0   C  **
** 8/ 1/81  1715  7920.0     5.6     8.5      8      78       9      91       3     49      **
** 8/ 1/81  1730  7920.0     5.5     8.6      8      79       9      91       3     49      **
** 8/ 1/81  1745  7920.0     4.7     9.1      9      81       9      89       3     48      **
** 8/ 1/81  1800  7920.0     4.0     9.5      9      82       9      86       3     47      **
** 8/ 1/81  1815  7920.0     4.2     9.4      9      82       9      87       3     47      **
** 8/ 1/81  1830  7920.0     4.2     9.4      9      82       9      87       3     47      **
** 8/ 1/81  1845  7920.0     4.2     9.4      9      83       9      88       3     48      **
** 8/ 1/81  1900  7920.0     3.9     9.6      9      83       9      87       3     47      **
** 8/ 1/81  1915  7920.0     4.0     9.6      9      84       9      88       3     48      **
** 8/ 1/81  1930  7920.0     4.0     9.7      9      85       9      90       3     48      **
** 8/ 1/81  1945  7920.0     3.5    10.1     10      86      10      88       3     47      **
** 8/ 1/81  2000  7920.0     3.2    10.3     10      86      10      86       3     47      **
** 8/ 1/81  2015  7920.0     3.4    10.2     11      86      11      87       3     47      **
** 8/ 1/81  2030  7920.0     3.5    10.0     11      85      11      87       3     47      **
** 8/ 1/81  2045  7920.0     3.6    10.0     11      84      11      86       3     47      **
** 8/ 1/81  2100  7920.0     3.5     9.9     12      83      12      85       4     46      **
** 8/ 1/81  2115  7920.0     3.6     9.8     13      81      13      83       4     45      **
** 8/ 1/81  2130  7920.0     3.6     9.8     12      82      12      84       4     46      **
** 8/ 1/81  2145  7920.0     3.2    10.0     13      83      13      83       4     45      **
** 8/ 1/81  2200  7920.0     3.3    10.0     13      84      13      85       4     46      **
** 8/ 1/81  2215  7920.0     3.2    10.0     12      84      12      84       3     46      **
** 8/ 1/81  2230  7920.0     3.7     9.7     12      83      12      86       4     46      **
** 8/ 1/81  2245  7920.0     3.7     9.8     13      84      13      87       4     47      **
** 8/ 1/81  2300  7920.0     3.3    10.0     13      85      13      86       4     46      **
** 8/ 1/81  2315  7920.0     3.3    10.0     13      84      13      85       4     46      **
** 8/ 1/81  2330  7920.0     3.3    10.0     13      84      13      85       4     46      **
** 8/ 1/81  2345  7920.0     3.6     9.8     13      84      13      86       4     47      **
** 8/ 1/81  2400  7920.0     3.7     9.8     13      85      13      88       4     47      **
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**                         PETROLEUM PROCESS HEATER, LOW NOX BURNERS                         **
**                                         15 MIN. DATA                                      **
**                                   DRY STACK GAS CONCENTRATION                             **
**                               O2      CO2     CO      NO      CO      NO      CO    NO  ACODE **
**                      LOAD    VOL%     VOL%   PPMV    PPMV    PPMV    PPMV    NG/J  NG/J     **
**     DATE    TIME      B/D    MEAS     MEAS   MEAS    MEAS    3%O2    3%O2                   **
***********************************************************************************************
** 8/ 2/81      15    7920.0    3.6      9.9     13      85      13      87      4     47      **
** 8/ 2/81      30    7920.0    3.5      9.9     13      85      13      87      4     47      **
** 8/ 2/81      45        .0     .0       .0      0       0       0       0      0      0   C  **
** 8/ 2/81     100    7920.0    4.3      9.4      5      80       5      86      1     46      **
** 8/ 2/81     115    7920.0    4.3      9.4      5      80       5      86      1     46      **
** 8/ 2/81     130    7920.0    4.0      9.6      5      81       5      85      1     46      **
** 8/ 2/81     145    7920.0    3.5      9.9      5      84       5      86      1     46      **
** 8/ 2/81     200    7920.0    3.3     10.0      5      85       5      86      1     46      **
** 8/ 2/81     215    7920.0    3.4     10.0      5      85       5      86      1     47      **
** 8/ 2/81     230    7920.0    3.4     10.0      5      85       5      86      1     47      **
** 8/ 2/81     245    7920.0    3.3     10.1      5      84       5      85      1     46      **
** 8/ 2/81     300    7920.0    3.4     10.0      5      85       5      86      1     47      **
** 8/ 2/81     315    7920.0    3.2     10.1      5      85       5      85      1     46      **
** 8/ 2/81     330    7920.0    3.1     10.2      5      85       5      85      1     46      **
** 8/ 2/81     345    7920.0    3.0     10.3      5      84       5      84      1     45      **
** 8/ 2/81     400    7920.0    2.9     10.4      5      84       4      83      1     45      **
** 8/ 2/81     415    7920.0    2.7     10.5      5      85       4      83      1     45      **
** 8/ 2/81     430    7920.0    2.6     10.6      5      84       4      82      1     44      **
** 8/ 2/81     445    7920.0    3.0     10.3      5      84       5      84      1     45      **
** 8/ 2/81     500    7920.0    3.1     10.2      5      85       5      85      1     46      **
** 8/ 2/81     515    7920.0    3.2     10.1      5      84       5      84      1     46      **
** 8/ 2/81     530    7920.0    3.6      9.8      4      84       4      86      1     47      **
** 8/ 2/81     545    7920.0    3.4     10.0      4      84       4      85      1     46      **
** 8/ 2/81     600    7920.0    3.8      9.7      4      83       4      86      1     47      **
** 8/ 2/81     615    7920.0    3.2     10.2      4      84       4      84      1     46      **
** 8/ 2/81     630    7920.0    3.5      9.9      4      85       4      87      1     47      **
** 8/ 2/81     645    7920.0    3.4     10.0      4      84       4      85      1     46      **
** 8/ 2/81     700    7920.0    2.8     10.4      4      85       3      84      1     45      **
** 8/ 2/81     715    7920.0    1.9     10.9     24      83      22      78      7     42      **
** 8/ 2/81     730    7920.0    3.1     10.1      4      84       4      84      1     45      **
** 8/ 2/81     745    7920.0    3.7      9.8      3      84       3      87      1     47      **
** 8/ 2/81     800    7920.0    4.0      9.6      3      84       3      88      1     48      **
** 8/ 2/81     815    7920.0    3.9      9.8      3      85       3      89      1     48      **
** 8/ 2/81     830    7920.0    3.4     10.3      3      87       3      88      1     48      **
** 8/ 2/81     845        .0     .0       .0      0       0       0       0      0      0   C  **
** 8/ 2/81     900    7920.0    4.9      9.2      9      80      10      89      3     48      **
** 8/ 2/81     915    7920.0    5.2      9.0      9      80      10      91      3     49      **
** 8/ 2/81     930    7920.0    5.4      8.9      9      79      10      91      3     49      **
** 8/ 2/81     945    7920.0    4.5      9.4      9      83       9      90      3     49      **
** 8/ 2/81    1000    7920.0    5.1      9.0      8      82       9      92      2     50      **
** 8/ 2/81    1015    7920.0    5.1      9.0      8      82       9      92      2     50      **
** 8/ 2/81    1030    7920.0    5.0      9.0      8      81       9      91      2     49      **
** 8/ 2/81    1045    7920.0    4.6      9.3      8      83       8      91      2     49      **
** 8/ 2/81    1100    7920.0    4.8      9.1      7      82       7      91      2     49      **
** 8/ 2/81    1115    7920.0    4.8      9.2      7      82       7      91      2     49      **
** 8/ 2/81    1130    7920.0    4.7      9.2      7      82       7      90      2     49      **
** 8/ 2/81    1145    7920.0    4.5      9.3      7      83       7      90      2     49      **
** 8/ 2/81    1200    7920.0    4.1      9.6      7      83       7      88      2     47      **
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**                       PETROLEUM PROCESS HEATER, LOW NOX BURNERS                        **
**                                     15 MIN. DATA                                       **
**                          DRY STACK GAS CONCENTRATION                          9        **
**                           O2      CO2     CO      NO      CO      NO      CO      NO  ACODE **
**                  LOAD    VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J       **
**   DATE    TIME    B/D    MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                       **
********************************************************************************************
** 8/ 2/81  1215  7920.0    4.1     9.6      8      82       8      87       2      47        **
** 8/ 2/81  1230  7920.0    4.3     9.7     15      80      16      86       5      46        **
** 8/ 2/81  1245  7920.0    4.1     9.7     15      77      15      82       5      44        **
** 8/ 2/81  1300  7920.0    4.2     9.3     14      73      15      78       4      42        **
** 8/ 2/81  1315  7920.0    3.8     8.6     13      66      13      69       4      37        **
** 8/ 2/81  1330  7920.0    3.6     8.4     10      66      10      68       3      37        **
** 8/ 2/81  1345  7920.0    3.4     8.2      6      64       6      65       2      35        **
** 8/ 2/81  1400  7920.0    3.3     8.1      5      63       5      64       1      34        **
** 8/ 2/81  1415  7920.0    2.8     8.3      6      63       5      62       1      33        **
** 8/ 2/81  1430  7920.0    3.0     8.1      6      63       6      63       1      34        **
** 8/ 2/81  1445  7920.0    2.0     8.5     25      61      23      57       7      31        **
** 8/ 2/81  1500      .0     .0      .0      0       0       0       0       0       0   C    **
** 8/ 2/81  1515      .0     .0      .0      0       0       0       0       0       0   C    **
** 8/ 2/81  1530  7920.0    2.9     8.0      6      63       5      62       1      33        **
** 8/ 2/81  1545  7920.0    3.1     7.8      6      62       6      62       1      33        **
** 8/ 2/81  1600  7920.0    3.1     7.9      6      62       6      62       1      33        **
** 8/ 2/81  1615  7920.0    3.1     7.8      6      61       6      61       1      33        **
** 8/ 2/81  1630  7920.0    3.1     7.9      7      62       7      62       2      33        **
** 8/ 2/81  1645      .0     .0      .0      0       0       0       0       0       0   C    **
** 8/ 2/81  1700      .0     .0      .0      0       0       0       0       0       0   C    **
** 8/ 2/81  1715  7920.0    5.6     8.6      9      78      10      91       3      49        **
** 8/ 2/81  1730  7920.0    5.5     8.7      9      78      10      90       3      49        **
** 8/ 2/81  1745  7920.0    5.1     8.9     10      80      11      90       3      49        **
** 8/ 2/81  1800  7920.0    4.9     9.0      9      80      10      89       3      48        **
** 8/ 2/81  1815  7920.0    5.2     8.8      9      81      10      92       3      50        **
** 8/ 2/81  1830  7920.0    5.3     8.8      9      80      10      91       3      49        **
** 8/ 2/81  1845  7920.0    4.8     9.1      8      81       8      90       2      48        **
** 8/ 2/81  1900  7920.0    5.1     8.9      8      80       9      90       2      49        **
** 8/ 2/81  1915  7920.0    4.9     9.0      9      81      10      90       3      49        **
** 8/ 2/81  1930  7920.0    5.2     8.8      8      81       9      92       3      50        **
** 8/ 2/81  1945  7920.0    4.8     9.1      9      81      10      90       3      48        **
** 8/ 2/81  2000  7920.0    4.7     9.2      9      80       9      88       3      47        **
** 8/ 2/81  2015  7920.0    4.4     9.3     10      80      10      86       3      47        **
** 8/ 2/81  2030  7920.0    4.7     9.1     10      78      11      86       3      46        **
** 8/ 2/81  2045  7920.0    5.1     8.9     10      78      11      88       3      47        **
** 8/ 2/81  2100  7920.0    4.9     9.0     10      78      11      87       3      47        **
** 8/ 2/81  2115  7920.0    4.8     9.0     12      78      13      86       4      47        **
** 8/ 2/81  2130  7920.0    5.0     9.0     11      78      12      87       4      47        **
** 8/ 2/81  2145  7920.0    5.1     8.9     11      78      12      88       4      47        **
** 8/ 2/81  2200  7920.0    4.9     9.2     19      79      21      88       6      47        **
** 8/ 2/81  2215  7920.0    4.8     9.3     19      80      21      88       6      48        **
** 8/ 2/81  2230  7920.0    4.7     9.1     11      79      12      87       4      47        **
** 8/ 2/81  2245  7920.0    4.8     9.1     11      79      12      87       4      47        **
** 8/ 2/81  2300  7920.0    4.8     9.0     11      80      12      88       4      48        **
** 8/ 2/81  2315  7920.0    4.6     9.2     11      80      12      87       3      47        **
** 8/ 2/81  2330  7920.0    4.6     9.2     11      79      12      86       3      47        **
** 8/ 2/81  2345  7920.0    4.4     9.3     12      80      13      86       4      47        **
** 8/ 2/81  2400  7920.0    4.5     9.3     12      80      13      87       4      47        **
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**                        PETROLEUM PROCESS HEATER, LOW NOX BURNERS                      **
**                                        15 MIN. DATA                                   **
**                               DRY STACK GAS CONCENTRATION                             **
**                                02      CO2     CO      NO      CO      NO      CO      NO  ACODE  **
**                        LOAD   VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J       **
**   DATE      TIME       B/D    MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                       **
*******************************************************************************************
** 8/ 3/81       15    7920.0    4.4     9.4      11      80      11      86       3      47         **
** 8/ 3/81       30    7920.0    4.1     9.2      11      77      11      82       3      44         **
** 8/ 3/81       45        .0     .0      .0       0       0       0       0       0       0    C    **
** 8/ 3/81      100    7920.0    4.7     9.1       3      77       3      85       1      46         **
** 8/ 3/81      115    7920.0    4.[illegible]     9.1       3      77       3      85       1      46         **
** 8/ 3/81      130    7920.0    4.8     9.0       3      76       3      84       1      45         **
** 8/ 3/81      145    7920.0    4.3     9.4       3      76       3      81       1      44         **
** 8/ 3/81      200    7920.0    4.2     9.4       3      76       3      81       1      44         **
** 8/ 3/81      215    7920.0    4.4     9.3       3      76       3      82       1      44         **
** 8/ 3/81      230    7920.0    4.7     9.1       3      76       3      83       1      45         **
** 8/ 3/81      245    7920.0    4.6     9.2       3      76       3      83       1      45         **
** 8/ 3/81      300    7920.0    4.7     9.1       3      77       3      85       1      46         **
** 8/ 3/81      315    7920.0    4.7     9.1       3      77       3      85       1      46         **
** 8/ 3/81      330    7920.0    4.9     9.0       3      76       3      85       1      46         **
** 8/ 3/81      345    7920.0    4.4     9.3       3      77       3      83       1      45         **
** 8/ 3/81      400    7920.0    4.2     9.4       4      76       4      81       1      44         **
** 8/ 3/81      415    7920.0    3.9     9.6       4      77       4      81       1      43         **
** 8/ 3/81      430    7920.0    4.5     9.2       4      77       4      84       1      45         **
** 8/ 3/81      445    7920.0    4.3     9.4       4      78       4      84       1      45         **
** 8/ 3/81      500    7920.0    4.9     8.9       4      77       4      86       1      46         **
** 8/ 3/81      515    7920.0    5.3     8.7       3      77       3      88       1      47         **
** 8/ 3/81      530    7920.0    5.5     8.6       3      75       3      87       1      47         **
** 8/ 3/81      545    7920.0    5.1     8.8       3      77       3      87       1      47         **
** 8/ 3/81      600    7920.0    4.0     9.5       3      78       3      82       1      44         **
** 8/ 3/81      615    7920.0    4.8     9.0       4      78       4      86       1      47         **
** 8/ 3/81      630    7920.0    5.0     8.9       4      78       4      87       1      47         **
** 8/ 3/81      645    7920.0    4.8     9.0       4      79       4      87       1      47         **
** 8/ 3/81      700    7920.0    4.8     9.0       4      79       4      87       1      47         **
** 8/ 3/81      715    7920.0    4.9     8.9       3      79       3      88       1      47         **
** 8/ 3/81      730    7920.0    4.9     9.0       3      79       3      88       1      47         **
** 8/ 3/81      745    7920.0    4.9     9.0       3      79       3      88       1      47         **
** 8/ 3/81      800    7920.0    5.2     8.8       3      79       3      90       1      48         **
** 8/ 3/81      815    7920.0    5.5     8.6       3      78       3      90       1      49         **
** 8/ 3/81      830        .0     .0      .0       0       0       0       0       0       0    C    **
** 8/ 3/81      845    7920.0    5.5     9.0      23      79      26      91       8      49         **
** 8/ 3/81      900    7920.0    6.7     7.9       9      71      11      89       3      48         **
** 8/ 3/81      915    7920.0    6.9     7.8       7      70       8      89       2      48         **
** 8/ 3/81      930    7920.0    6.4     8.1       7      72       8      88       2      48         **
** 8/ 3/81      945    7920.0    5.6     8.6       8      76       9      88       3      48         **
** 8/ 3/81     1000        .0     .0      .0       0       0       0       0       0       0    C    **
** 8/ 3/81     1015        .0     .0      .0       0       0       0       0       0       0    C    **
** 8/ 3/81     1030    7920.0    7.2     7.6       6      72       7      94       2      51         **
** 8/ 3/81     1045    7920.0    6.8     7.9       7      74       8      93       2      50         **
** 8/ 3/81     1100    7920.0    6.7     7.9       7      74       8      93       2      50         **
** 8/ 3/81     1115    7920.0    6.8     7.9       6      73       7      92       2      50         **
** 8/ 3/81     1130    7920.0    6.5     8.0       7      75       8      93       2      50         **
** 8/ 3/81     1145    7920.0    6.8     7.9       7      74       8      93       2      50         **
** 8/ 3/81     1200    7920.0    6.2     8.3       7      75       8      91       2      49         **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 3/81	1215	7920.0	5.6	8.6	7	78	8	91	2	49	
8/ 3/81	1230	7920.0	5.8	8.5	7	78	8	92	2	50	
8/ 3/81	1245	7920.0	6.0	8.4	6	78	7	93	2	50	
8/ 3/81	1300	7920.0	5.9	8.5	6	79	7	94	2	51	
8/ 3/81	1315	7920.0	6.1	8.3	6	78	7	94	2	51	
8/ 3/81	1330	7920.0	6.1	8.3	6	79	7	95	2	51	
8/ 3/81	1345	7920.0	6.0	8.4	6	79	7	94	2	51	
8/ 3/81	1400	.0	.0	.0	0	0	0	0	0	0	C
8/ 3/81	1415	.0	.0	.0	0	0	0	0	0	0	C
8/ 3/81	1430	7920.0	4.0	9.6	8	83	8	87	2	47	
8/ 3/81	1445	7920.0	4.6	9.2	8	84	8	92	2	50	
8/ 3/81	1500	7920.0	5.6	8.6	26	83	30	97	10	52	
8/ 3/81	1515	7920.0	2.0	10.1	21	80	19	75	6	41	
8/ 3/81	1530	7920.0	2.2	10.7	29	81	27	77	9	42	
8/ 3/81	1545	7920.0	2.6	10.4	10	85	9	83	3	45	
8/ 3/81	1600	.0	.0	.0	0	0	0	0	0	0	C
8/ 3/81	1615	.0	.0	.0	0	0	0	0	0	0	I
8/ 3/81	1630	.0	.0	.0	0	0	0	0	0	0	I
8/ 3/81	1645	7920.0	3.5	10.1	7	88	7	90	2	49	
8/ 3/81	1700	7920.0	3.3	10.1	17	75	17	76	5	41	
8/ 3/81	1715	7920.0	4.0	9.7	6	77	6	81	2	44	
8/ 3/81	1730	7920.0	4.1	9.6	6	76	6	80	2	43	
8/ 3/81	1745	7920.0	4.0	9.7	6	77	6	81	2	44	
8/ 3/81	1800	7920.0	3.6	9.9	8	76	8	78	2	42	
8/ 3/81	1815	7920.0	3.6	9.9	7	76	7	78	2	42	
8/ 3/81	1830	7920.0	4.3	9.5	7	77	7	83	2	45	
8/ 3/81	1845	7920.0	4.5	9.4	6	77	6	84	2	45	
8/ 3/81	1900	7920.0	4.5	9.4	6	77	6	84	2	45	
8/ 3/81	1915	7920.0	4.7	9.3	7	77	7	85	2	46	
8/ 3/81	1930	7920.0	4.6	9.3	7	77	7	84	2	45	
8/ 3/81	1945	7920.0	4.4	9.4	7	78	7	84	2	45	
8/ 3/81	2000	7920.0	4.3	9.5	8	78	8	84	2	45	
8/ 3/81	2015	7920.0	4.1	9.6	8	77	8	82	2	44	
8/ 3/81	2030	7920.0	4.1	9.6	8	77	8	82	2	44	
8/ 3/81	2045	7920.0	3.6	9.9	9	77	9	79	3	43	
8/ 3/81	2100	7920.0	3.7	9.9	10	77	10	80	3	43	
8/ 3/81	2115	7920.0	3.6	9.9	10	78	10	80	3	43	
8/ 3/81	2130	7920.0	3.8	9.8	10	77	10	80	3	43	
8/ 3/81	2145	7920.0	3.3	10.1	10	77	10	78	3	42	
8/ 3/81	2200	7920.0	3.3	10.1	10	78	10	79	3	43	
8/ 3/81	2215	7920.0	3.7	9.9	10	79	10	82	3	44	
8/ 3/81	2230	7920.0	3.5	10.0	9	78	9	80	3	43	
8/ 3/81	2245	7920.0	3.5	10.0	10	79	10	81	3	44	
8/ 3/81	2300	7920.0	3.6	9.9	10	79	10	81	3	44	
8/ 3/81	2315	7920.0	3.9	9.8	10	81	10	85	3	46	
8/ 3/81	2330	7920.0	3.7	9.9	9	80	9	83	3	45	
8/ 3/81	2345	7920.0	3.8	9.9	9	81	9	84	3	45	
8/ 3/81	2400	7920.0	3.8	9.9	9	82	9	85	3	46	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 4/81	15	7755.0	3.7	9.9	10	81	10	84	3	45	
8/ 4/81	30	.0	.0	.0	0	0	0	0	0	0	C
8/ 4/81	45	7755.0	2.7	9.2	0	80	0	78	0	42	
8/ 4/81	100	7755.0	2.5	9.3	0	80	0	77	0	42	
8/ 4/81	115	7755.0	2.2	9.5	0	78	0	74	0	40	
8/ 4/81	130	7755.0	2.2	9.4	0	78	0	74	0	40	
8/ 4/81	145	7755.0	2.2	9.5	0	79	0	75	0	41	
8/ 4/81	200	7755.0	2.2	9.5	0	79	0	75	0	41	
8/ 4/81	215	7755.0	1.9	9.7	8	77	7	72	2	39	
8/ 4/81	230	7755.0	2.1	9.5	7	77	6	73	2	39	
8/ 4/81	245	7755.0	2.0	9.6	0	79	0	74	0	40	
8/ 4/81	300	7755.0	2.4	9.4	0	79	0	76	0	41	
8/ 4/81	315	7755.0	2.9	9.1	0	81	0	80	0	43	
8/ 4/81	330	7755.0	3.1	9.0	0	80	0	80	0	43	
8/ 4/81	345	7755.0	3.0	8.9	0	81	0	81	0	43	
8/ 4/81	400	7755.0	3.4	8.8	0	81	0	82	0	44	
8/ 4/81	415	7755.0	3.0	9.0	0	80	0	80	0	43	
8/ 4/81	430	7755.0	2.6	9.2	0	78	0	76	0	41	
8/ 4/81	445	7755.0	2.1	9.5	0	77	0	73	0	39	
8/ 4/81	500	7755.0	2.4	9.3	0	78	0	75	0	40	
8/ 4/81	515	7755.0	2.6	9.2	0	79	0	77	0	41	
8/ 4/81	530	7755.0	2.2	9.4	0	79	0	75	0	41	
8/ 4/81	545	7755.0	1.9	9.6	8	77	7	72	2	39	
8/ 4/81	600	7755.0	2.6	9.3	0	79	0	77	0	41	
8/ 4/81	615	7755.0	3.0	9.0	0	80	0	80	0	43	
8/ 4/81	630	7755.0	3.3	8.9	0	80	0	81	0	44	
8/ 4/81	645	7755.0	2.6	9.2	0	78	0	76	0	41	
8/ 4/81	700	7755.0	2.4	9.4	0	77	0	74	0	40	
8/ 4/81	715	7755.0	3.1	8.8	0	80	0	80	0	43	
8/ 4/81	730	7755.0	4.0	8.5	0	79	0	83	0	45	
8/ 4/81	745	7755.0	3.9	8.6	0	80	0	84	0	45	
8/ 4/81	800	7755.0	4.0	8.5	0	81	0	85	0	46	
8/ 4/81	815	7755.0	.0	.0	0	0	0	0	0	0	C
8/ 4/81	830	7755.0	.0	.0	0	0	0	0	0	0	C
8/ 4/81	845	7755.0	4.6	9.3	8	81	8	88	2	48	
8/ 4/81	900	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	915	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	930	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	945	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	1000	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	1015	7755.0	4.5	9.3	7	80	7	87	2	47	
8/ 4/81	1030	7755.0	3.4	10.0	7	83	7	84	2	46	
8/ 4/81	1045	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	1100	7755.0	5.2	8.9	7	83	7	94	2	51	
8/ 4/81	1115	7755.0	.0	.0	0	0	0	0	0	0	J
8/ 4/81	1130	7755.0	5.2	8.9	7	80	7	91	2	49	
8/ 4/81	1145	7755.0	5.5	8.7	6	80	6	92	2	50	
8/ 4/81	1200	7755.0	5.5	8.8	6	80	6	92	2	50	

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**                            PETROLEUM PROCESS HEATER, LOW NOX BURNERS                             **
**                                          15 MIN. DATA                                            **
**                                  DRY STACK GAS CONCENTRATION                                     **
**                             O2      CO2      CO       NO       CO       NO       CO      NO  ACODE **
**                     LOAD   VOL%     VOL%    PPMV     PPMV     PPMV     PPMV     NG/J    NG/J      **
**  DATE      TIME     B/D    MEAS     MEAS    MEAS     MEAS     3%O2     3%O2                       **
******************************************************************************************************
** 8/ 4/81   1215   7755.0    4.9      9.2       7       81        7       90        2      49         **
** 8/ 4/81   1230   7755.0    4.6      9.3       6       83        6       91        2      49         **
** 8/ 4/81   1245   7755.0    4.4      9.5       6       83        6       90        2      48         **
** 8/ 4/81   1300   7755.0    4.1      9.7       6       83        6       88        2      47         **
** 8/ 4/81   1315       .0     .0       .0       0        0        0        0        0       0   C     **
** 8/ 4/81   1330   7755.0    4.0      9.7       5       83        5       87        1      47         **
** 8/ 4/81   1345   7755.0    3.8      9.9       6       82        6       85        2      46         **
** 8/ 4/81   1400   7755.0    4.1      9.7       5       82        5       87        1      47         **
** 8/ 4/81   1415   7755.0    3.4     10.0      14       80       14       81        4      44         **
** 8/ 4/81   1430   7755.0    2.9     10.3       7       81        6       80        2      43         **
** 8/ 4/81   1445   7755.0    3.0     10.3       6       82        6       82        1      44         **
** 8/ 4/81   1500   7755.0    3.4     10.1       6       82        6       83        2      45         **
** 8/ 4/81   1515   7755.0    4.2      9.5       6       85        6       91        2      49         **
** 8/ 4/81   1530   7755.0    4.3      9.4       6       84        6       90        2      49         **
** 8/ 4/81   1545   7755.0    4.3      9.4       6       84        6       90        2      49         **
** 8/ 4/81   1600   7755.0    4.6      9.3       6       84        6       92        2      50         **
** 8/ 4/81   1615   7755.0    4.6      9.3       6       85        6       93        2      50         **
** 8/ 4/81   1630       .0     .0       .0       0        0        0        0        0       0   C     **
** 8/ 4/81   1645       .0     .0       .0       0        0        0        0        0       0   C     **
** 8/ 4/81   1700       .0     .0       .0       0        0        0        0        0       0   C     **
** 8/ 4/81   1715       .0     .0       .0       0        0        0        0        0       0   J     **
** 8/ 4/81   1730       .0     .0       .0       0        0        0        0        0       0   J     **
** 8/ 4/81   1745       .0     .0       .0       0        0        0        0        0       0   J     **
** 8/ 4/81   1800       .0     .0       .0       0        0        0        0        0       0   J     **
** 8/ 4/81   1815   7755.0    3.2     10.1       6       81        6       81        1      44         **
** 8/ 4/81   1830   7755.0    4.1      9.6       6       82        6       87        2      47         **
** 8/ 4/81   1845   7755.0    3.7      9.9       6       81        6       84        2      45         **
** 8/ 4/81   1900   7755.0    3.6      9.9       7       81        7       83        2      45         **
** 8/ 4/81   1915   7755.0    3.3     10.1       7       81        7       82        2      44         **
** 8/ 4/81   1930   7755.0    3.3      9.9       7       80        7       81        2      44         **
** 8/ 4/81   1945   7755.0    4.0      9.7       7       81        7       85        2      46         **
** 8/ 4/81   2000   7755.0    4.1      9.6       8       81        8       86        2      46         **
** 8/ 4/81   2015   7755.0    3.9      9.7       9       81        9       85        3      46         **
** 8/ 4/81   2030   7755.0    4.0      9.7       9       81        9       85        3      46         **
** 8/ 4/81   2045   7755.0    4.1      9.6       9       82        9       87        3      47         **
** 8/ 4/81   2100   7755.0    4.1      9.7      10       82       10       87        3      47         **
** 8/ 4/81   2115   7755.0    3.7      9.9      10       83       10       86        3      46         **
** 8/ 4/81   2130   7755.0    3.4     10.1      10       82       10       83        3      45         **
** 8/ 4/81   2145   7755.0    3.7      9.9      10       82       10       85        3      46         **
** 8/ 4/81   2200   7755.0    4.0      9.7      10       83       10       87        3      47         **
** 8/ 4/81   2215   7755.0    3.4     10.1      10       82       10       83        3      45         **
** 8/ 4/81   2230   7755.0    2.8     10.4      10       82        9       81        3      43         **
** 8/ 4/81   2245   7755.0    2.8     10.5      10       82        9       81        3      43         **
** 8/ 4/81   2300   7755.0    3.2     10.2      10       83       10       83        3      45         **
** 8/ 4/81   2315   7755.0    3.4     10.1      10       83       10       84        3      46         **
** 8/ 4/81   2330   7755.0    3.4     10.1      10       83       10       84        3      46         **
** 8/ 4/81   2345   7755.0    3.3     10.2      10       83       10       84        3      45         **
** 8/ 4/81   2400   7755.0    3.6     10.0      10       83       10       85        3      46         **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 5/81	15	8580.0	3.5	10.1	10	83	10	85	3	46	
8/ 5/81	30	.0	.0	.0	0	0	0	0	0	0	C
8/ 5/81	45	8580.0	3.4	9.2	1	81	1	82	0	44	
8/ 5/81	100	8580.0	3.5	9.1	1	81	1	83	0	45	
8/ 5/81	115	8580.0	3.4	9.2	2	80	2	81	0	44	
8/ 5/81	130	8580.0	3.8	9.0	1	81	1	84	0	45	
8/ 5/81	145	8580.0	3.4	9.2	1	81	1	82	0	44	
8/ 5/81	200	8580.0	3.8	8.9	1	81	1	84	0	45	
8/ 5/81	215	8580.0	3.7	9.0	1	80	1	83	0	45	
8/ 5/81	230	8580.0	3.5	9.1	1	80	1	82	0	44	
8/ 5/81	245	8580.0	2.9	9.4	215	78	213	77	70	42	
8/ 5/81	300	8580.0	2.3	9.7	25	78	24	75	7	40	
8/ 5/81	315	8580.0	3.3	9.2	1	80	1	81	0	44	
8/ 5/81	330	8580.0	3.4	9.2	1	80	1	81	0	44	
8/ 5/81	345	8580.0	3.4	9.1	1	79	1	80	0	43	
8/ 5/81	400	8580.0	3.2	9.2	1	79	1	79	0	43	
8/ 5/81	415	8580.0	3.7	9.0	1	80	1	83	0	45	
8/ 5/81	430	8580.0	3.7	9.0	1	80	1	83	0	45	
8/ 5/81	445	8580.0	3.8	9.0	1	80	1	83	0	45	
8/ 5/81	500	8580.0	3.6	9.0	1	80	1	82	0	44	
8/ 5/81	515	8580.0	3.6	9.0	1	80	1	82	0	44	
8/ 5/81	530	8580.0	3.9	8.8	1	80	1	84	0	45	
8/ 5/81	545	8580.0	3.7	9.0	1	80	1	83	0	45	
8/ 5/81	600	8580.0	3.9	8.9	1	81	1	85	0	46	
8/ 5/81	615	8580.0	3.9	8.8	1	81	1	85	0	46	
8/ 5/81	630	8580.0	4.3	8.6	0	80	0	86	0	46	
8/ 5/81	645	8580.0	4.7	8.4	0	79	0	87	0	47	
8/ 5/81	700	8580.0	4.8	8.4	0	79	0	87	0	47	
8/ 5/81	715	8580.0	4.6	8.5	1	79	1	86	0	47	
8/ 5/81	730	8580.0	4.4	8.6	1	80	1	86	0	47	
8/ 5/81	745	8580.0	4.6	8.5	0	79	0	86	0	47	
8/ 5/81	800	8580.0	4.6	8.5	1	79	1	86	0	47	
8/ 5/81	815	8580.0	4.7	8.4	0	79	0	87	0	47	
8/ 5/81	830	.0	.0	.0	0	0	0	0	0	0	C
8/ 5/81	845	8580.0	4.7	9.1	7	79	7	87	2	47	
8/ 5/81	900	8580.0	5.0	8.9	8	79	9	88	2	48	
8/ 5/81	915	8580.0	4.7	9.1	7	79	7	87	2	47	
8/ 5/81	930	8580.0	4.9	8.9	8	79	8	88	2	47	
8/ 5/81	945	8580.0	4.8	9.0	7	79	7	87	2	47	
8/ 5/81	1000	8580.0	5.1	8.9	7	79	7	89	2	48	
8/ 5/81	1015	8580.0	5.1	8.9	7	78	7	88	2	47	
8/ 5/81	1030	8580.0	5.0	8.9	7	80	7	90	2	48	
8/ 5/81	1045	.0	.0	.0	0	0	0	0	0	0	C
8/ 5/81	1100	8580.0	5.7	9.9	0	71	0	83	0	45	
8/ 5/81	1115	8580.0	5.2	8.8	6	80	6	91	2	49	
8/ 5/81	1130	8580.0	4.9	9.0	7	81	7	90	2	49	
8/ 5/81	1145	8580.0	4.7	9.2	7	82	7	90	2	49	
8/ 5/81	1200	8580.0	4.5	9.3	7	82	7	89	2	48	

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**                              PETROLEUM PROCESS HEATER, LOW NOX BURNERS                        **
**                                            15 MIN. DATA                                       **
**                                   DRY STACK GAS CONCENTRATION                                 **
**                           O2     CO2      CO      NO      CO      NO      CO      NO  ACODE   **
**                  LOAD   VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J          **
**   DATE   TIME     B/D   MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                          **
***************************************************************************************************
** 8/ 5/81  1215  8580.0    4.5     9.3       7      82       7      89       2      48          **
** 8/ 5/81  1230  8580.0    4.5     9.3       6      82       6      89       2      48          **
** 8/ 5/81  1245      .0     .0      .0       0       0       0       0       0       0      C   **
** 8/ 5/81  1300  8580.0    4.7     9.2       7      81       7      89       2      48          **
** 8/ 5/81  1315  8580.0    4.8     9.1       6      81       6      90       2      48          **
** 8/ 5/81  1330  8580.0    4.4     9.4       6      83       6      90       2      48          **
** 8/ 5/81  1345  8580.0    4.0     9.6       6      82       6      86       2      47          **
** 8/ 5/81  1400  8580.0    4.2     9.5       6      82       6      87       2      47          **
** 8/ 5/81  1415  8580.0    4.3     9.4       6      82       6      88       2      47          **
** 8/ 5/81  1430  8580.0    4.1     9.5       7      81       7      86       2      46          **
** 8/ 5/81  1445  8580.0    3.8     9.7       7      82       7      85       2      46          **
** 8/ 5/81  1500  8580.0    3.2    10.1       7      82       7      82       2      44          **
** 8/ 5/81  1515  8580.0    3.1    10.1       7      83       7      83       2      45          **
** 8/ 5/81  1530  8580.0    2.8    10.3       8      84       7      83       2      45          **
** 8/ 5/81  1545  8580.0    3.1    10.1       8      85       8      85       2      46          **
** 8/ 5/81  1600  8580.0    3.5     9.9       8      85       8      87       2      47          **
** 8/ 5/81  1615  8580.0    3.2    10.0       8      85       8      85       2      46          **
** 8/ 5/81  1630      .0     .0      .0       0       0       0       0       0       0      C   **
** 8/ 5/81  1645  8580.0    3.6     9.8       8      84       8      86       2      47          **
** 8/ 5/81  1700  8580.0    3.5     9.9       8      84       8      86       2      46          **
** 8/ 5/81  1715  8580.0    3.1    10.1       8      84       8      84       2      45          **
** 8/ 5/81  1730  8580.0    3.1    10.1       8      84       8      84       2      45          **
** 8/ 5/81  1745  8580.0    3.7     9.7       8      84       8      87       2      47          **
** 8/ 5/81  1800  8580.0    3.8     9.7       9      84       9      87       3      47          **
** 8/ 5/81  1815  8580.0    3.9     9.6       9      83       9      87       3      47          **
** 8/ 5/81  1830  8580.0    3.4     9.9       9      84       9      85       3      46          **
** 8/ 5/81  1845  8580.0    3.5     9.9       9      84       9      86       3      46          **
** 8/ 5/81  1900  8580.0    3.6     9.8       9      84       9      86       3      47          **
** 8/ 5/81  1915  8580.0    3.7     9.7       9      84       9      87       3      47          **
** 8/ 5/81  1930  8580.0    3.6     9.8       8      84       8      86       2      47          **
** 8/ 5/81  1945  8580.0    3.1    10.1       9      84       9      84       2      45          **
** 8/ 5/81  2000  8580.0    2.8    10.1       8      84       7      83       2      45          **
** 8/ 5/81  2015  8580.0    3.1    10.1      10      84      10      84       3      45          **
** 8/ 5/81  2030  8580.0    2.9    10.2      10      84       9      83       3      45          **
** 8/ 5/81  2045  8580.0    2.4    10.5      11      84      10      81       3      44          **
** 8/ 5/81  2100  8580.0    2.1    10.7      11      84      10      79       3      43          **
** 8/ 5/81  2115  8580.0    2.9    10.2      11      84      10      83       3      45          **
** 8/ 5/81  2130  8580.0    3.5     9.8      10      84      10      86       3      46          **
** 8/ 5/81  2145  8580.0    3.6     9.8      10      84      10      86       3      47          **
** 8/ 5/81  2200  8580.0    3.3    10.0      10      84      10      85       3      46          **
** 8/ 5/81  2215  8580.0    3.4     9.9      10      84      10      85       3      46          **
** 8/ 5/81  2230  8580.0    3.4     9.9      10      84      10      85       3      46          **
** 8/ 5/81  2245  8580.0    3.2    10.0      10      84      10      84       3      46          **
** 8/ 5/81  2300  8580.0    2.6    10.0      10      83       9      81       3      44          **
** 8/ 5/81  2315  8580.0    2.8    10.3      11      84      10      83       3      45          **
** 8/ 5/81  2330  8580.0    3.2    10.0      10      84      10      84       3      46          **
** 8/ 5/81  2345  8580.0    3.2    10.0      10      84      10      84       3      46          **
** 8/ 5/81  2400  8580.0    3.0    10.1      11      84      11      84       3      45          **
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**                        PETROLEUM PROCESS HEATER, LOW NOX BURNERS                               **
**                                           15 MIN. DATA                                         **
**                                DRY STACK GAS CONCENTRATION                                     **
**                                   O2     CO2      CO      NO      CO      NO      CO      NO ACODE    **
**                          LOAD   VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J          **
**    DATE  TIME       B/D   MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                          **
****************************************************************************************************
** 8/ 6/81    15   8580.0    2.7    10.4      11      84      10      82       3      44          **
** 8/ 6/81    30       .0     .0      .0       0       0       0       0       0       0     C    **
** 8/ 6/81    45   8580.0    3.0     9.5       2      81       2      81       0      43          **
** 8/ 6/81   100   8580.0    3.1     9.4       2      82       2      82       0      44          **
** 8/ 6/81   115   8580.0    2.9     9.5       2      80       1      79       0      43          **
** 8/ 6/81   130   8580.0    2.8     9.6       2      81       1      80       0      43          **
** 8/ 6/81   145   8580.0    2.9     9.5       2      81       1      80       0      43          **
** 8/ 6/81   200   8580.0    2.8     9.6       2      81       1      80       0      43          **
** 8/ 6/81   215   8580.0    2.8     9.5       2      80       1      79       0      42          **
** 8/ 6/81   230   8580.0    3.0    10.1       2      80       2      80       0      43          **
** 8/ 6/81   245   8580.0    3.0     9.5       2      81       2      81       0      43          **
** 8/ 6/81   300   8580.0    3.3     9.2       2      82       2      83       0      45          **
** 8/ 6/81   315   8580.0    3.4     9.2       2      82       2      83       0      45          **
** 8/ 6/81   330   8580.0    3.1     9.4       2      82       2      82       0      44          **
** 8/ 6/81   345   8580.0    2.9     9.4       2      82       1      81       0      44          **
** 8/ 6/81   400   8580.0    3.2     9.3       2      83       2      83       0      45          **
** 8/ 6/81   415   8580.0    3.3     9.3       2      82       2      83       0      45          **
** 8/ 6/81   430   8580.0    3.1     9.4       2      83       2      83       0      45          **
** 8/ 6/81   445   8580.0    2.8     9.6       2      81       1      80       0      43          **
** 8/ 6/81   500   8580.0    3.0     9.5       2      81       2      81       0      43          **
** 8/ 6/81   515   8580.0    3.1     9.4       2      81       2      81       0      44          **
** 8/ 6/81   530   8580.0    3.0     9.4       2      81       2      81       0      43          **
** 8/ 6/81   545   8580.0    3.0     9.5       2      80       2      80       0      43          **
** 8/ 6/81   600   8580.0    3.1     9.4       2      80       2      80       0      43          **
** 8/ 6/81   615   8580.0    3.7     9.0       2      80       2      83       0      45          **
** 8/ 6/81   630   8580.0    3.9     8.9       2      80       2      84       0      45          **
** 8/ 6/81   645   8580.0    3.6     9.1       1      80       1      82       0      44          **
** 8/ 6/81   700   8580.0    2.3     9.9      26      79      25      76       8      41          **
** 8/ 6/81   715   8580.0    3.3     9.1       1      80       1      81       0      44          **
** 8/ 6/81   730   8580.0    4.0     8.9       1      80       1      84       0      45          **
** 8/ 6/81   745   8580.0    3.8     9.0       1      79       1      82       0      44          **
** 8/ 6/81   800   8580.0    3.7     9.0       1      79       1      82       0      44          **
** 8/ 6/81   815       .0     .0      .0       0       0       0       0       0       0     C    **
** 8/ 6/81   830       .0     .0      .0       0       0       0       0       0       0     C    **
** 8/ 6/81   845   8580.0    4.9     8.9       6      79       6      88       2      47          **
** 8/ 6/81   900   8580.0    4.9     8.9       7      79       7      88       2      47          **
** 8/ 6/81   915   8580.0    4.5     9.2       6      79 [illegible] 86       2      46          **
** 8/ 6/81   930   8580.0    4.7     9.1       6      79       6      87       2      47          **
** 8/ 6/81   945   8580.0    4.7     9.1       6      82       6      90       2      49          **
** 8/ 6/81  1000   8580.0    4.5     9.2       7      83       7      90       2      49          **
** 8/ 6/81  1015   8580.0    4.2     9.4       7      82       7      87       2      47          **
** 8/ 6/81  1030   8580.0    4.3     9.3       7      81       7      87       2      47          **
** 8/ 6/81  1045   8580.0    4.5     9.2       7      81       7      88       2      47          **
** 8/ 6/81  1100   8580.0    4.4     9.3       7      81       7      87       2      47          **
** 8/ 6/81  1115   8580.0    4.5     9.2       7      81       7      88       2      47          **
** 8/ 6/81  1130   8580.0    4.8     9.0       6      79       6      87       2      47          **
** 8/ 6/81  1145       .0     .0      .0       0       0       0       0       0       0     C    **
** 8/ 6/81  1200       .0     .0      .0       0       0       0       0       0       0     C    **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 6/81	1215	8580.0	4.8	9.1	6	78	6	86	2	47	
8/ 6/81	1230	8580.0	4.7	9.2	6	79	6	87	2	47	
8/ 6/81	1245	8580.0	5.1	8.9	6	78	6	88	2	47	
8/ 6/81	1300	8580.0	9.8	5.8	4	52	6	83	2	45	
8/ 6/81	1315	8580.0	7.1	7.6	5	66	6	85	2	46	
8/ 6/81	1330	8580.0	4.6	9.2	5	78	5	85	1	46	
8/ 6/81	1345	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	1400	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	1415	8580.0	4.9	9.0	5	77	5	86	1	46	
8/ 6/81	1430	8580.0	4.1	9.6	6	79	6	84	2	45	
8/ 6/81	1445	8580.0	4.4	9.3	5	79	5	85	1	46	
8/ 6/81	1500	8580.0	4.6	9.2	5	78	5	85	1	46	
8/ 6/81	1515	8580.0	4.7	9.1	5	78	5	86	1	46	
8/ 6/81	1530	8580.0	4.6	9.2	6	79	6	86	2	47	
8/ 6/81	1545	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	1600	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	1615	8580.0	4.4	8.6	63	63	68	68	22	37	
8/ 6/81	1630	8580.0	4.1	9.6	13	89	13	94	4	51	
8/ 6/81	1645	8580.0	4.6	9.1	7	81	7	88	2	48	
8/ 6/81	1700	8580.0	4.9	8.9	6	81	6	90	2	49	
8/ 6/81	1715	8580.0	4.9	9.0	7	81	7	90	2	49	
8/ 6/81	1730	8580.0	5.0	8.9	7	80	7	90	2	48	
8/ 6/81	1745	8580.0	4.8	9.0	8	81	8	90	2	48	
8/ 6/81	1800	8580.0	5.1	8.8	7	80	7	90	2	49	
8/ 6/81	1815	8580.0	5.2	8.8	7	79	7	90	2	48	
8/ 6/81	1830	8580.0	5.1	8.8	7	80	7	90	2	49	
8/ 6/81	1845	8580.0	5.6	8.6	6	79	7	92	2	50	
8/ 6/81	1900	8580.0	5.5	8.6	7	78	8	90	2	49	
8/ 6/81	1915	8580.0	6.1	8.2	6	76	7	91	2	49	
8/ 6/81	1930	8580.0	7.0	7.6	5	71	6	91	2	49	
8/ 6/81	1945	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	2000	.0	.0	.0	0	0	0	0	0	0	C
8/ 6/81	2015	8580.0	4.7	9.1	8	77	8	85	2	46	
8/ 6/81	2030	8580.0	3.5	9.8	9	82	9	84	3	45	
8/ 6/81	2045	8580.0	3.7	9.7	9	82	9	85	3	46	
8/ 6/81	2100	8580.0	4.1	9.4	9	82	9	87	3	47	
8/ 6/81	2115	8580.0	3.9	9.6	9	82	9	86	3	46	
8/ 6/81	2130	8580.0	4.0	9.5	9	82	9	86	3	47	
8/ 6/81	2145	8580.0	4.0	9.5	9	82	9	86	3	47	
8/ 6/81	2200	8580.0	4.1	9.5	9	82	9	87	3	47	
8/ 6/81	2215	8580.0	4.3	9.4	9	81	9	87	3	47	
8/ 6/81	2230	8580.0	4.3	9.4	10	81	10	87	3	47	
8/ 6/81	2245	8580.0	4.3	9.4	9	81	9	87	3	47	
8/ 6/81	2300	8580.0	4.3	9.3	9	81	9	87	3	47	
8/ 6/81	2315	8580.0	4.4	9.3	9	81	9	87	3	47	
8/ 6/81	2330	8580.0	4.1	9.5	9	81	9	86	3	46	
8/ 6/81	2345	8580.0	4.2	9.4	9	81	9	86	3	47	
8/ 6/81	2400	8580.0	4.5	9.2	9	80	9	87	3	47	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 7/81	15	8580.0	3.2	9.3	0	77	0	77	0	42	
8/ 7/81	30	8580.0	3.3	10.0	3	78	3	79	1	43	
8/ 7/81	45	8580.0	3.0	10.2	3	78	3	78	0	42	
8/ 7/81	100	8580.0	3.0	10.1	3	77	3	77	0	41	
8/ 7/81	115	8580.0	2.8	10.3	4	78	3	77	1	41	
8/ 7/81	130	8580.0	2.9	10.2	3	79	2	78	0	42	
8/ 7/81	145	8580.0	2.4	10.6	4	79	3	76	1	41	
8/ 7/81	200	8580.0	2.3	10.5	4	78	3	75	1	40	
8/ 7/81	215	8580.0	2.3	10.6	4	79	3	76	1	41	
8/ 7/81	230	8580.0	2.7	10.3	4	79	3	77	1	42	
8/ 7/81	245	8580.0	2.4	10.6	4	78	3	75	1	40	
8/ 7/81	300	8580.0	2.3	10.5	4	78	3	75	1	40	
8/ 7/81	315	8580.0	2.2	10.7	4	78	3	74	1	40	
8/ 7/81	330	8580.0	2.4	10.5	4	78	3	75	1	40	
8/ 7/81	345	8580.0	2.7	10.3	4	78	3	76	1	41	
8/ 7/81	400	8580.0	2.8	10.3	4	77	3	76	1	41	
8/ 7/81	415	8580.0	2.4	10.5	4	77	3	74	1	40	
8/ 7/81	430	8580.0	2.6	10.4	3	77	2	75	0	40	
8/ 7/81	445	8580.0	2.8	10.3	4	78	3	77	1	41	
8/ 7/81	500	8580.0	2.9	10.0	3	77	2	76	0	41	
8/ 7/81	515	8580.0	3.0	10.1	3	78	3	78	0	42	
8/ 7/81	530	8580.0	3.0	10.1	3	78	3	78	0	42	
8/ 7/81	545	8580.0	2.9	10.2	3	78	2	77	0	42	
8/ 7/81	600	8580.0	2.9	10.2	3	78	2	77	0	42	
8/ 7/81	615	8580.0	2.9	10.2	3	78	2	77	0	42	
8/ 7/81	630	8580.0	3.2	10.0	3	78	3	78	0	42	
8/ 7/81	645	8580.0	2.9	10.2	3	77	2	76	0	41	
8/ 7/81	700	8580.0	3.5	9.7	3	77	3	79	1	42	
8/ 7/81	715	8580.0	3.9	9.6	3	78	3	82	1	44	
8/ 7/81	730	8580.0	3.8	9.6	3	77	3	80	1	43	
8/ 7/81	745	8580.0	3.7	9.6	3	78	3	81	1	44	
8/ 7/81	800	.0	.0	.0	0	0	0	0	0	0	C
8/ 7/81	815	8560.0	4.3	9.5	0	80	0	86	0	46	
8/ 7/81	830	8580.0	4.0	9.6	7	78	7	82	2	44	
8/ 7/81	845	8580.0	3.9	9.6	7	78	7	82	2	44	
8/ 7/81	900	8580.0	4.0	9.6	7	77	7	81	2	44	
8/ 7/81	915	8580.0	4.0	9.6	6	78	6	82	2	44	
8/ 7/81	930	8580.0	4.1	9.5	6	75	6	79	2	43	
8/ 7/81	945	8580.0	4.1	9.5	6	78	6	83	2	45	
8/ 7/81	1000	8580.0	4.1	9.6	5	79	5	84	1	45	
8/ 7/81	1015	8580.0	3.8	9.7	6	80	6	83	2	45	
8/ 7/81	1030	8580.0	3.6	9.8	6	80	6	82	2	44	
8/ 7/81	1045	8580.0	3.7	9.8	5	80	5	83	1	45	
8/ 7/81	1100	8580.0	3.6	9.8	5	81	5	83	1	45	
8/ 7/81	1115	8580.0	3.5	9.9	5	82	5	84	1	45	
8/ 7/81	1130	8580.0	3.4	10.0	5	83	5	84	1	46	
8/ 7/81	1145	8580.0	3.2	10.1	5	82	5	82	1	44	
8/ 7/81	1200	8580.0	3.4	10.0	5	81	5	82	1	44	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

			DRY STACK GAS CONCENTRATION								
DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/ 7/81	1215	8580.0	3.5	9.9	5	80	5	82	1	44	
8/ 7/81	1230	8580.0	3.5	10.0	4	80	4	82	1	44	
8/ 7/81	1245	8580.0	3.4	10.0	4	80	4	81	1	44	
8/ 7/81	1300	8580.0	3.2	10.2	4	80	4	80	1	43	
8/ 7/81	1315	8580.0	2.6	10.5	4	80	3	78	1	42	
8/ 7/81	1330	8580.0	2.6	10.5	4	80	3	78	1	42	
8/ 7/81	1345	8580.0	2.8	10.5	4	82	3	81	1	43	
8/ 7/81	1400	8580.0	2.8	10.4	4	82	3	81	1	43	
8/ 7/81	1415	8580.0	2.7	10.5	4	84	3	82	1	44	
8/ 7/81	1430	8580.0	3.0	10.2	4	85	4	85	1	46	
8/ 7/81	1445	8580.0	3.3	10.1	4	87	4	88	1	48	
8/ 7/81	1500	8580.0	3.0	10.2	5	87	5	87	1	47	
8/ 7/81	1515	8580.0	3.1	10.2	5	87	5	87	1	47	
8/ 7/81	1530	8580.0	3.1	10.1	6	87	6	87	1	47	
8/ 7/81	1545	8580.0	3.3	10.0	5	89	5	90	1	49	
8/ 7/81	1600	.0	.0	.0	0	0	0	0	0	0	C
8/ 7/81	1615	8580.0	3.0	10.2	0	94	0	94	0	50	
8/ 7/81	1630	8580.0	3.0	10.2	9	81	9	81	2	43	
8/ 7/81	1645	8580.0	3.3	10.0	9	81	9	82	3	44	
8/ 7/81	1700	8580.0	3.4	9.9	9	81	9	82	3	44	
8/ 7/81	1715	8580.0	3.5	9.9	10	81	10	83	3	45	
8/ 7/81	1730	8580.0	3.3	10.0	10	81	10	82	3	44	
8/ 7/81	1745	8580.0	3.4	9.9	10	81	10	82	3	44	
8/ 7/81	1800	8580.0	3.5	9.8	10	80	10	82	3	44	
8/ 7/81	1815	8580.0	3.2	10.1	10	81	10	81	3	44	
8/ 7/81	1830	8580.0	2.6	10.4	10	81	9	79	3	42	
8/ 7/81	1845	8580.0	2.8	10.3	11	81	10	80	3	43	
8/ 7/81	1900	8580.0	3.1	10.1	10	81	10	81	3	44	
8/ 7/81	1915	8580.0	3.2	10.0	11	80	11	80	3	43	
8/ 7/81	1930	8580.0	2.9	10.2	11	79	10	78	3	42	
8/ 7/81	1945	8580.0	2.7	10.4	11	79	10	77	3	42	
8/ 7/81	2000	8580.0	2.9	10.2	11	80	10	79	3	43	
8/ 7/81	2015	8580.0	2.9	10.2	12	80	11	79	3	43	
8/ 7/81	2030	8580.0	3.1	10.1	12	81	12	81	3	44	
8/ 7/81	2045	8580.0	3.0	10.2	12	81	12	81	3	43	
8/ 7/81	2100	8580.0	2.9	10.2	12	80	11	79	3	43	
8/ 7/81	2115	8580.0	3.4	9.9	12	80	12	81	4	44	
8/ 7/81	2130	8580.0	7.0	7.6	11	68	14	87	4	47	
8/ 7/81	2145	8580.0	7.0	7.6	10	67	12	86	4	46	
8/ 7/81	2200	8580.0	3.2	10.0	12	80	12	80	3	43	
8/ 7/81	2215	8580.0	2.5	10.5	13	80	12	77	4	42	
8/ 7/81	2230	8580.0	2.3	10.6	13	80	12	76	4	41	
8/ 7/81	2245	8580.0	2.2	10.7	13	80	12	76	4	41	
8/ 7/81	2300	8580.0	2.7	10.4	13	80	12	78	4	42	
8/ 7/81	2315	8580.0	2.9	10.3	13	81	12	80	4	43	
8/ 7/81	2330	8580.0	7.7	7.1	10	61	13	82	4	44	
8/ 7/81	2345	8580.0	7.6	7.3	10	64	13	86	4	46	
8/ 7/81	2400	8580.0	5.8	7.6	0	68	0	80	0	43	

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**************************************************************************************************
**                       PETROLEUM PROCESS HEATER, LOW NOX BURNERS                              **
**                                           15 MIN. DATA                                       **
**                                    DRY STACK GAS CONCENTRATION                               **
**                            O2     CO2      CO      NO      CO      NO      CO      NO ACODE  **
**                   LOAD   VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J        **
**   DATE   TIME      B/D   MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                        **
**************************************************************************************************
** 8/ 8/81    15       .0     .0      .0       0       0       0       0       0       0  C     **
** 8/ 8/81    30   8580.0    4.4     9.0       3      78       3      84       1      45        **
** 8/ 8/81    45   8580.0    4.2     9.1       3      78       3      83       1      45        **
** 8/ 8/81   100   8580.0    4.2     9.1       3      78       3      83       1      45        **
** 8/ 8/81   115   8580.0    4.7     8.8       3      77       3      85       1      46        **
** 8/ 8/81   130   8580.0    4.6     8.8       3      78       3      85       1      46        **
** 8/ 8/81   145   8580.0    4.4     9.0       3      78       3      84       1      45        **
** 8/ 8/81   200   8580.0    4.3     9.0       3      78       3      84       1      45        **
** 8/ 8/81   215   8580.0    4.4     8.9       3      78       3      84       1      45        **
** 8/ 8/81   230   8580.0    4.2     9.1       3      79       3      84       1      45        **
** 8/ 8/81   245   8580.0    4.2     9.1       3      79       3      84       1      45        **
** 8/ 8/81   300   8580.0    3.6     9.5       3      80       3      82       1      44        **
** 8/ 8/81   315   8580.0    4.0     9.2       3      78       3      82       1      44        **
** 8/ 8/81   330   8580.0    3.9     9.3       3      78       3      82       1      44        **
** 8/ 8/81   345   8580.0    4.0     9.1       3      78       3      82       1      44        **
** 8/ 8/81   400   8580.0    3.8     9.3       3      78       3      81       1      44        **
** 8/ 8/81   415   8580.0    4.1     9.2       3      78       3      83       1      45        **
** 8/ 8/81   430   8580.0    4.3     9.0       3      78       3      84       1      45        **
** 8/ 8/81   445   8580.0    4.4     9.0       3      78       3      84       1      45        **
** 8/ 8/81   500   8580.0    4.4     9.0       3      78       3      84       1      45        **
** 8/ 8/81   515   8580.0    4.2     9.1       3      78       3      83       1      45        **
** 8/ 8/81   530   8580.0    4.3     9.0       3      78       3      84       1      45        **
** 8/ 8/81   545   8580.0    4.3     9.1       3      78       3      84       1      45        **
** 8/ 8/81   600   8580.0    4.4     9.0       2      77       2      83       0      45        **
** 8/ 8/81   615   8580.0    4.3     9.0       2      77       2      83       0      45        **
** 8/ 8/81   630   8580.0    4.4     9.0       2      77       2      83       0      45        **
** 8/ 8/81   645   8580.0    4.6     8.9       2      77       2      84       0      45        **
** 8/ 8/81   700   8580.0    4.7     8.8       2      77       2      85       0      46        **
** 8/ 8/81   715   8580.0    4.8     8.7       2      76       2      84       0      45        **
** 8/ 8/81   730   8580.0    4.9     8.7       2      76       2      85       0      46        **
** 8/ 8/81   745   8580.0    5.0     8.6       2      76       2      85       0      46        **
** 8/ 8/81   800   8580.0    5.1     8.6       2      76       2      86       0      46        **
** 8/ 8/81   815   8580.0    4.4     8.6      16      63      17      68       5      37        **
** 8/ 8/81   830   8580.0    5.3     8.7       7      75       8      86       2      46        **
** 8/ 8/81   845   8580.0    5.3     8.7       7      76       8      87       2      47        **
** 8/ 8/81   900   8580.0    5.4     8.6       7      75       8      86       2      46        **
** 8/ 8/81   915   8580.0    4.6     8.9      17      66      18      72       6      39        **
** 8/ 8/81   930   8580.0    4.9     8.9       6      77       6      86       2      46        **
** 8/ 8/81   945   8580.0    4.9     8.9       6      77       6      86       2      46        **
** 8/ 8/81  1000   8580.0    5.0     8.9       6      77       6      86       2      47        **
** 8/ 8/81  1015   8580.0    5.5     8.6       5      76       5      88       1      47        **
** 8/ 8/81  1030   8580.0    5.1     8.9       6      77       6      87       2      47        **
** 8/ 8/81  1045   8580.0    5.0     8.9       6      77       6      86       2      47        **
** 8/ 8/81  1100   8580.0    5.0     8.9       6      77       6      86       2      47        **
** 8/ 8/81  1115       .0     .0      .0       0       0       0       0       0       0  C     **
** 8/ 8/81  1130       .0     .0      .0       0       0       0       0       0       0  C     **
** 8/ 8/81  1145   8580.0    4.3     9.4       5      80       5      86       1      46        **
** 8/ 8/81  1200   8580.0    4.5     9.3       6      79       6      86       2      46        **
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**                            PETROLEUM PROCESS HEATER, LOW NOX BURNERS                 **
**                                       15 MIN. DATA                                   **
**                                DRY STACK GAS CONCENTRATION                           **
**                          O2    CO2     CO     NO     CO     NO     CO     NO ACODE   **
**                  LOAD  VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J         **
**   DATE   TIME     B/D  MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                       **
******************************************************************************************
** 8/ 8/81  1215  8580.0   4.8    9.1      6     79      6     87      2     47         **
** 8/ 8/81  1230  8580.0   4.6    9.2      5     79      5     86      1     47         **
** 8/ 8/81  1245  8580.0   4.5    9.3      5     79      5     86      1     46         **
** 8/ 8/81  1300  8580.0   4.4    9.4      5     80      5     86      1     47         **
** 8/ 8/81  1315  8580.0   4.3    9.5      5     80      5     86      1     46         **
** 8/ 8/81  1330      .0    .0     .0      0      0      0      0      0      0     C   **
** 8/ 8/81  1345  8580.0   4.5    9.4      5     81      5     88      1     47         **
** 8/ 8/81  1400  8580.0   4.8    9.2      5     81      5     90      1     48         **
** 8/ 8/81  1415  8580.0   4.7    9.2      5     81      5     89      1     48         **
** 8/ 8/81  1430  8580.0   4.5    9.3      5     82      5     89      1     48         **
** 8/ 8/81  1445  8580.0   4.3    9.5      5     83      5     89      1     48         **
** 8/ 8/81  1500  8580.0   4.2    9.5      5     83      5     88      1     48         **
** 8/ 8/81  1515      .0    .0     .0      0      0      0      0      0      0     C   **
** 8/ 8/81  1530      .0    .0     .0      0      0      0      0      0      0     C   **
** 8/ 8/81  1545  8580.0   4.1    9.5      6     82      6     87      2     47         **
** 8/ 8/81  1600  8580.0   3.8    8.7      3     82      3     85      1     46         **
** 8/ 8/81  1615  8580.0   3.9    8.7     11     82     11     86      3     46         **
** 8/ 8/81  1630  8580.0   4.3    9.5      7     83      7     89      2     48         **
** 8/ 8/81  1645  8580.0   4.5    9.4      7     82      7     89      2     48         **
** 8/ 8/81  1700  8580.0   4.5    9.4      7     82      7     89      2     48         **
** 8/ 8/81  1715  8580.0   4.3    9.5      7     82      7     88      2     47         **
** 8/ 8/81  1730  8580.0   3.8    9.8      8     83      8     86      2     47         **
** 8/ 8/81  1745  8580.0   3.5   10.0      8     83      8     85      2     46         **
** 8/ 8/81  1800  8580.0   3.9    9.8      8     83      8     87      2     47         **
** 8/ 8/81  1815  8580.0   4.0    9.7      8     82      8     86      2     47         **
** 8/ 8/81  1830  8580.0   3.9    9.7      8     83      8     87      2     47         **
** 8/ 8/81  1845  8580.0   3.8    9.8      7     83      7     86      2     47         **
** 8/ 8/81  1900  8580.0   3.8    9.8      7     83      7     86      2     47         **
** 8/ 8/81  1915  8580.0   3.9    9.7      8     85      8     89      2     48         **
** 8/ 8/81  1930  8580.0   3.9    9.8      7     84      7     88      2     47         **
** 8/ 8/81  1945  8580.0   3.6    9.9      7     83      7     85      2     46         **
** 8/ 8/81  2000  8580.0   3.5    9.9      8     81      8     83      2     45         **
** 8/ 8/81  2015  8580.0   3.5   10.0      8     82      8     84      2     45         **
** 8/ 8/81  2030  8580.0   3.6    9.9      9     82      9     84      3     46         **
** 8/ 8/81  2045  8580.0   3.4   10.1      9     82      9     83      3     45         **
** 8/ 8/81  2100  8580.0   3.3   10.1      9     82      9     83      3     45         **
** 8/ 8/81  2115  8580.0   3.3   10.0     10     80     10     81      3     44         **
** 8/ 8/81  2130  8580.0   3.7    9.7     10     76     10     79      3     42         **
** 8/ 8/81  2145  8580.0   3.3    9.7     10     68     10     69      3     37         **
** 8/ 8/81  2200  8580.0   3.1   10.0     10     69     10     69      3     37         **
** 8/ 8/81  2215  8580.0   2.9   10.1     10     68      9     67      3     36         **
** 8/ 8/81  2230  8580.0   3.0   10.1     10     69     10     69      3     37         **
** 8/ 8/81  2245  8580.0   3.2   10.1     11     73     11     73      3     40         **
** 8/ 8/81  2300  8580.0   3.2   10.2     11     81     11     81      3     44         **
** 8/ 8/81  2315  8580.0   3.3   10.2     11     80     11     81      3     44         **
** 8/ 8/81  2330  8580.0   3.3   10.2     11     81     11     82      3     44         **
** 8/ 8/81  2345  8580.0   3.2   10.2     11     80     11     80      3     43         **
** 8/ 8/81  2400  8580.0   3.2   10.3     11     80     11     80      3     43
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

			O2	CO2	CO	NO	CO	NO	CO	NO	ACODE
		LOAD	VOL%	VOL%	PPMV	PPMV	PPMV	PPMV	NG/J	NG/J	
DATE	TIME	B/D	MEAS	MEAS	MEAS	MEAS	3%O2	3%O2			
8/21/81	15	6550.0	10.0	4.5	0	49	0	80	0	43	
8/21/81	30	6550.0	10.0	4.5	0	49	0	80	0	43	
8/21/81	45	6550.0	9.9	4.6	0	50	0	81	0	44	
8/21/81	100	6550.0	11.8	3.2	30	30	59	59	19	32	
8/21/81	115	6550.0	13.2	3.0	69	10	160	23	52	12	
8/21/81	130	6550.0	12.7	3.2	30	17	65	37	21	20	
8/21/81	145	6550.0	13.9	2.5	260	4	664	10	218	5	
8/21/81	200	6550.0	13.8	2.7	227	3	572	7	188	4	
8/21/81	215	6550.0	13.0	3.2	46	11	104	24	34	13	
8/21/81	230	6550.0	13.2	3.0	73	10	169	23	55	12	
8/21/81	245	6550.0	13.9	2.5	253	2	646	5	212	2	
8/21/81	300	6550.0	14.0	2.4	338	1	876	2	288	1	
8/21/81	315	6550.0	13.9	2.6	254	1	649	2	213	1	
8/21/81	330	6550.0	13.8	2.7	187	2	471	5	155	2	
8/21/81	345	6550.0	13.8	2.7	208	1	524	2	172	1	
8/21/81	400	6550.0	13.8	2.7	188	1	473	2	155	1	
8/21/81	415	6550.0	13.6	2.9	139	3	340	7	112	3	
8/21/81	430	6550.0	13.6	2.9	108	4	264	9	87	5	
8/21/81	445	6550.0	13.5	2.9	107	4	258	9	85	5	
8/21/81	500	6550.0	13.6	2.9	124	4	304	9	100	5	
8/21/81	515	6550.0	13.9	2.6	245	3	626	7	206	4	
8/21/81	530	6550.0	13.9	2.6	249	3	636	7	209	4	
8/21/81	545	6550.0	13.7	2.8	150	4	372	9	122	5	
8/21/81	600	6550.0	13.1	3.1	44	11	100	25	33	13	
8/21/81	615	6550.0	13.0	3.1	36	13	81	29	26	15	
8/21/81	630	6550.0	12.9	3.1	26	15	58	33	19	18	
8/21/81	645	6550.0	12.8	3.2	27	16	59	35	19	19	
8/21/81	700	6550.0	12.7	3.3	21	17	45	37	15	20	
8/21/81	715	6550.0	12.1	3.5	3	26	6	52	2	28	
8/21/81	730	.0	.0	.0	0	0	0	0	0	0	C
8/21/81	745	6550.0	10.0	6.3	12	38	19	62	6	33	
8/21/81	800	6550.0	12.0	4.6	13	29	26	58	8	31	
8/21/81	815	6550.0	9.2	6.4	10	46	15	70	5	38	
8/21/81	830	6550.0	6.1	8.3	6	72	7	87	2	47	
8/21/81	845	6550.0	10.0	5.6	5	51	8	83	2	45	
8/21/81	900	6550.0	10.8	5.2	5	44	8	77	2	42	
8/21/81	915	6550.0	8.2	7.0	6	60	8	84	2	45	
8/21/81	930	6550.0	5.4	8.8	7	78	8	90	2	48	
8/21/81	945	6550.0	5.9	8.2	15	75	17	89	5	48	
8/21/81	1000	6550.0	6.5	7.8	-1	71	-1	88	-1	47	
8/21/81	1015	6550.0	9.3	6.1	43	52	66	80	21	43	
8/21/81	1030	6550.0	12.7	2.3	104	19	227	41	74	22	
8/21/81	1045	6550.0	9.4	5.2	175	44	272	68	89	37	
8/21/81	1100	6550.0	11.7	4.7	41	35	79	68	26	36	
8/21/81	1115	6550.0	12.2	4.4	17	30	34	61	11	33	
8/21/81	1130	6550.0	11.8	4.6	11	35	21	68	7	37	
8/21/81	1145	6550.0	11.9	4.5	10	34	19	67	6	36	
8/21/81	1200	6550.0	11.8	4.5	10	34	19	66	6	36	

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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                            **
**                                       15 MIN. DATA                                            **
**                               DRY STACK GAS CONCENTRATION                                     **
**                              O2     CO2      CO      NO      CO      NO      CO      NO  ACODE **
**                      LOAD   VOL%    VOL%   PPMV    PPMV    PPMV    PPMV    NG/J    NG/J        **
**   DATE     TIME      B/D    MEAS    MEAS   MEAS    MEAS    3%O2    3%O2                        **
***************************************************************************************************
** 8/21/81    1215   6550.0    11.3     4.9      5      41       9      76       3      41         **
** 8/21/81    1230   6550.0     8.6     6.6      4      62       5      90       1      48         **
** 8/21/81    1245   6550.0     7.4     7.4      5      70       6      92       2      50         **
** 8/21/81    1300   6550.0    10.6     5.1     -1      45      -1      78      -1      42         **
** 8/21/81    1315   6550.0    10.6     5.3      4      48       6      83       2      45         **
** 8/21/81    1330   6550.0    10.3     5.4      3      51       5      86       1      46         **
** 8/21/81    1345   6550.0     5.9     8.5      5      78       5      93       1      50         **
** 8/21/81    1400   6550.0     8.1     7.0      1      66       1      92       0      50         **
** 8/21/81    1415   6550.0    10.1     5.6      3      55       4      91       1      49         **
** 8/21/81    1430   6550.0    10.1     5.6      3      56       4      92       1      50         **
** 8/21/81    1445   6550.0     9.4     6.1      4      61       6      94       2      51         **
** 8/21/81    1500   6550.0     9.6     5.8      4      57       6      90       2      48         **
** 8/21/81    1515   6550.0     9.6     5.9      4      56       6      88       2      48         **
** 8/21/81    1530       .0      .0      .0      0       0       0       0       0       0   C     **
** 8/21/81    1545       .0      .0      .0      0       0       0       0       0       0   C     **
** 8/21/81    1600   6550.0     7.7     6.6      6      51       8      69       2      37         **
** 8/21/81    1615   6550.0     9.9     5.9      3      58       4      94       1      51         **
** 8/21/81    1630   6550.0    10.7     5.4      6      52      10      91       3      49         **
** 8/21/81    1645   6550.0    10.5     5.6      5      52       8      89       2      48         **
** 8/21/81    1700   6550.0     9.0     6.5      6      64       9      96       2      52         **
** 8/21/81    1715   6550.0     9.2     6.4      6      63       9      96       3      52         **
** 8/21/81    1730   6550.0     9.3     6.4      6      64       9      98       3      53         **
** 8/21/81    1745   6550.0     8.4     7.0      6      71       8     101       2      55         **
** 8/21/81    1800   6550.0     8.0     7.2      6      73       8     101       2      54         **
** 8/21/81    1815   6550.0     8.0     7.2      6      73       8     101       2      54         **
** 8/21/81    1830   6550.0     8.0     7.2      8      74      11     102       3      55         **
** 8/21/81    1845   6550.0    10.0     5.9      5      59       8      96       2      52         **
** 8/21/81    1900   6550.0    10.6     5.5      5      53       8      92       2      49         **
** 8/21/81    1915   6550.0     9.1     6.4      4      63       6      95       1      51         **
** 8/21/81    1930   6550.0     7.1     7.8      7      75       9      97       2      52         **
** 8/21/81    1945   6550.0     7.2     7.7      7      75       9      97       3      53         **
** 8/21/81    2000   6550.0     9.4     6.2      5      61       7      94       2      51         **
** 8/21/81    2015   6550.0     8.1     7.1      7      69       9      96       3      52         **
** 8/21/81    2030   6550.0     7.2     7.7      8      75      10      97       3      53         **
** 8/21/81    2045   6550.0     7.4     7.6      8      74      10      98       3      53         **
** 8/21/81    2100   6550.0     8.1     7.1      8      70      11      97       3      53         **
** 8/21/81    2115   6550.0     9.9     5.9      7      58      11      94       3      51         **
** 8/21/81    2130   6550.0    11.4     5.0      8      43      15      81       4      43         **
** 8/21/81    2145   6550.0    11.9     4.8     13      36      25      71       8      38         **
** 8/21/81    2200   6550.0    12.5     4.5     25      27      53      57      17      31         **
** 8/21/81    2215   6550.0    12.8     4.4     35      22      77      48      25      26         **
** 8/21/81    2230   6550.0    12.1     4.7     19      30      38      61      12      33         **
** 8/21/81    2245   6550.0    11.0     5.3      8      44      14      79       4      43         **
** 8/21/81    2300   6550.0    10.8     5.4      8      45      14      79       4      43         **
** 8/21/81    2315   6550.0    11.4     5.1     12      39      22      73       7      39         **
** 8/21/81    2330       .0      .0      .0      0       0       0       0       0       0   C     **
** 8/21/81    2345   6550.0     6.5     7.8      1      70       1      87       0      47         **
** 8/21/81    2400   6550.0     7.3     7.3      1      65       1      85       0      46         **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/22/81	15	6550.0	9.9	5.7	0	51	0	82	0	45	
8/22/81	30	6550.0	10.3	5.4	0	47	0	79	0	43	
8/22/81	45	6550.0	9.8	5.7	0	50	0	80	0	43	
8/22/81	100	6550.0	8.9	6.3	0	57	0	85	0	46	
8/22/81	115	6550.0	8.7	6.4	1	58	1	85	0	46	
8/22/81	130	6550.0	8.9	6.3	1	57	1	85	0	46	
8/22/81	145	6550.0	8.9	6.3	1	59	1	88	0	47	
8/22/81	200	6550.0	8.6	6.5	1	59	1	85	0	46	
8/22/81	215	6550.0	8.3	6.7	1	60	1	85	0	46	
8/22/81	230	6550.0	8.3	6.7	1	61	1	86	0	47	
8/22/81	245	6550.0	8.3	6.7	1	61	1	86	0	47	
8/22/81	300	6550.0	7.1	7.5	1	67	1	86	0	47	
8/22/81	315	6550.0	6.5	7.9	1	70	1	87	0	47	
8/22/81	330	6550.0	7.0	7.6	1	68	1	87	0	47	
8/22/81	345	6550.0	10.4	5.3	1	46	1	78	0	42	
8/22/81	400	6550.0	11.2	4.9	1	40	1	73	0	40	
8/22/81	415	6550.0	9.0	6.3	1	55	1	82	0	44	
8/22/81	430	6550.0	8.6	6.5	1	58	1	84	0	45	
8/22/81	445	6550.0	9.0	6.2	0	55	0	82	0	44	
8/22/81	500	6550.0	9.9	5.7	0	49	0	79	0	43	
8/22/81	515	6550.0	10.2	5.4	0	47	0	78	0	42	
8/22/81	530	6550.0	9.9	5.7	0	50	0	81	0	44	
8/22/81	545	6550.0	7.7	7.1	0	63	0	85	0	46	
8/22/81	600	6550.0	7.5	7.3	1	65	1	86	0	47	
8/22/81	615	6550.0	8.6	6.5	1	59	1	85	0	46	
8/22/81	630	6550.0	10.5	5.3	0	45	0	77	0	42	
8/22/81	645	6550.0	11.2	4.9	0	39	0	71	0	39	
8/22/81	700	6550.0	9.8	5.8	0	50	0	80	0	43	
8/22/81	715	6550.0	9.1	6.2	0	55	0	83	0	45	
8/22/81	730	.0	.0	.0	0	0	0	0	0	0	C
8/22/81	745	6550.0	9.3	6.2	5	55	7	84	2	46	
8/22/81	800	6550.0	9.6	6.1	5	54	7	85	2	46	
8/22/81	815	6550.0	9.8	5.9	4	52	6	83	2	45	
8/22/81	830	6550.0	8.5	6.8	5	61	7	88	2	47	
8/22/81	845	6550.0	7.2	7.7	6	68	7	88	2	48	
8/22/81	900	6550.0	7.6	7.4	5	66	6	88	2	48	
8/22/81	915	6550.0	11.8	4.7	26	33	51	64	16	35	
8/22/81	930	6550.0	13.4	4.0	66	15	157	35	51	19	
8/22/81	945	6550.0	10.2	5.8	4	49	6	81	2	44	
8/22/81	1000	6550.0	9.0	6.5	3	57	4	85	1	46	
8/22/81	1015	6550.0	8.9	6.6	5	59	7	88	2	47	
8/22/81	1030	6550.0	8.8	6.6	4	60	5	88	1	48	
8/22/81	1045	6550.0	8.5	6.8	4	62	5	89	1	48	
8/22/81	1100	6550.0	8.4	6.9	5	62	7	88	2	48	
8/22/81	1115	6550.0	7.6	7.4	5	65	6	87	2	47	
8/22/81	1130	6550.0	5.5	8.8	6	71	6	82	2	44	
8/22/81	1145	6550.0	4.6	9.4	6	73	6	80	2	43	
8/22/81	1200	6550.0	4.6	9.3	6	74	6	81	2	44	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

			O2	CO2	CO	NO	CO	NO	CO	NO	ACODE
		LOAD	VOL%	VOL%	PPMV	PPMV	PPMV	PPMV	NG/J	NG/J	
DATE	TIME	B/D	MEAS	MEAS	MEAS	MEAS	3%O2	3%O2			
8/22/81	1215	6550.0	4.5	9.4	6	75	6	81	2	44	
8/22/81	1230	6550.0	4.7	9.3	5	73	5	80	1	43	
8/22/81	1245	6550.0	7.7	7.3	4	64	5	86	1	47	
8/22/81	1300	6550.0	8.6	6.8	3	60	4	87	1	47	
8/22/81	1315	6550.0	4.5	9.5	6	73	6	79	2	43	
8/22/81	1330	6550.0	3.8	9.9	5	75	5	78	1	42	
8/22/81	1345	6550.0	8.2	6.9	3	61	4	85	1	46	
8/22/81	1400	6550.0	10.8	5.3	3	45	5	79	1	43	
8/22/81	1415	6550.0	10.7	5.4	3	45	5	78	1	42	
8/22/81	1430	6550.0	7.2	7.7	4	64	5	83	1	45	
8/22/81	1445	6550.0	6.9	7.8	5	64	6	81	2	44	
8/22/81	1500	6550.0	10.5	5.5	3	47	5	80	1	43	
8/22/81	1515	6550.0	7.0	7.8	4	66	5	84	1	46	
8/22/81	1530	.0	.0	.0	0	0	0	0	0	0	C
8/22/81	1545	6550.0	5.3	8.9	7	74	8	84	2	46	
8/22/81	1600	6550.0	5.3	8.9	6	75	6	86	2	46	
8/22/81	1615	6550.0	6.4	8.2	6	71	7	87	2	47	
8/22/81	1630	6550.0	6.6	8.0	6	69	7	86	2	46	
8/22/81	1645	6550.0	6.4	8.2	6	69	7	85	2	46	
8/22/81	1700	6550.0	6.4	8.2	6	68	7	83	2	45	
8/22/81	1715	6550.0	6.5	8.1	7	68	8	84	2	45	
8/22/81	1730	6550.0	6.7	8.0	7	67	8	84	2	45	
8/22/81	1745	6550.0	6.8	7.9	7	66	8	83	2	45	
8/22/81	1800	6550.0	7.0	7.7	7	66	9	84	2	46	
8/22/81	1815	6550.0	7.1	7.7	8	66	10	85	3	46	
8/22/81	1830	6550.0	7.2	7.6	8	65	10	84	3	46	
8/22/81	1845	6550.0	7.1	7.7	8	66	10	85	3	46	
8/22/81	1900	6550.0	6.6	8.0	8	68	10	85	3	46	
8/22/81	1915	6550.0	5.7	8.5	10	70	11	82	3	44	
8/22/81	1930	6550.0	5.3	8.8	9	72	10	82	3	44	
8/22/81	1945	6550.0	4.8	9.1	9	73	10	81	3	44	
8/22/81	2000	6550.0	4.9	9.0	9	73	10	81	3	44	
8/22/81	2015	6550.0	5.0	9.0	10	73	11	82	3	44	
8/22/81	2030	6550.0	6.5	8.1	10	70	12	87	4	47	
8/22/81	2045	6550.0	7.8	7.2	9	64	12	87	4	47	
8/22/81	2100	6550.0	8.6	6.7	9	60	13	87	4	47	
8/22/81	2115	6550.0	8.5	6.8	9	60	12	86	4	46	
8/22/81	2130	6550.0	7.3	7.5	10	65	13	85	4	46	
8/22/81	2145	6550.0	6.2	8.3	10	69	12	84	4	45	
8/22/81	2200	6550.0	7.4	7.5	9	65	11	86	3	46	
8/22/81	2215	6550.0	10.0	5.8	9	51	14	83	4	45	
8/22/81	2230	6550.0	9.1	6.5	9	56	13	84	4	46	
8/22/81	2245	6550.0	5.3	8.8	11	71	12	81	4	44	
8/22/81	2300	6550.0	4.6	9.3	11	74	12	81	3	44	
8/22/81	2315	6550.0	4.9	9.1	11	74	12	82	4	44	
8/22/81	2330	.0	.0	.0	0	0	0	0	0	0	C
8/22/81	2345	6550.0	8.0	6.3	2	60	2	83	0	45	
8/22/81	2400	6550.0	8.3	6.2	1	58	1	82	0	44	

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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                            **
**                                       15 MIN. DATA                                            **
**                               DRY STACK GAS CONCENTRATION                                     **
**                              O2      CO2     CO      NO      CO      NO      CO      NO  ACODE **
**                     LOAD    VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J       **
**   DATE      TIME     B/D    MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                       **
***************************************************************************************************
** 8/23/81       15  6700.0     8.3     6.2       1      58       1      82       0      44       **
** 8/23/81       30  6700.0     7.6     6.7       1      61       1      82       0      44       **
** 8/23/81       45  6700.0     6.9     7.0       1      64       1      81       0      44       **
** 8/23/81      100  6700.0     6.8     7.1       2      64       2      81       0      44       **
** 8/23/81      115  6700.0     6.6     7.2       2      64       2      80       0      43       **
** 8/23/81      130  6700.0     7.3     6.8       1      63       1      82       0      44       **
** 8/23/81      145  6700.0     7.2     6.8       1      63       1      82       0      44       **
** 8/23/81      200  6700.0     4.5     8.6       2      70       2      76       0      41       **
** 8/23/81      215  6700.0     2.8     9.6       2      73       1      72       0      39       **
** 8/23/81      230  6700.0     2.6     9.6       2      74       1      72       0      39       **
** 8/23/81      245  6700.0     4.5     8.4       2      72       2      78       0      42       **
** 8/23/81      300  6700.0     6.0     7.6       2      68       2      81       0      44       **
** 8/23/81      315  6700.0     6.0     7.6       2      68       2      81       0      44       **
** 8/23/81      330  6700.0     4.3     8.6       2      72       2      77       0      42       **
** 8/23/81      345  6700.0     3.5     9.1       2      75       2      77       0      41       **
** 8/23/81      400  6700.0     3.6     9.0       2      75       2      77       0      42       **
** 8/23/81      415  6700.0     6.2     7.5       2      68       2      82       0      44       **
** 8/23/81      430  6700.0     6.3     7.4       2      68       2      83       0      45       **
** 8/23/81      445  6700.0     6.2     7.5       2      67       2      81       0      44       **
** 8/23/81      500  6700.0     6.3     7.4       2      67       2      82       0      44       **
** 8/23/81      515  6700.0     6.2     7.5       2      67       2      81       0      44       **
** 8/23/81      530  6700.0     6.1     7.5       2      66       2      79       0      43       **
** 8/23/81      545  6700.0     6.0     7.6       2      67       2      80       0      43       **
** 8/23/81      600  6700.0     6.0     7.6       2      67       2      80       0      43       **
** 8/23/81      615  6700.0     6.3     7.4       2      67       2      82       0      44       **
** 8/23/81      630  6700.0     6.3     7.4       2      67       2      82       0      44       **
** 8/23/81      645  6700.0     6.0     7.6       2      67       2      80       0      43       **
** 8/23/81      700  6700.0     6.2     7.4       2      67       2      81       0      44       **
** 8/23/81      715  6700.0     6.2     7.4       2      66       2      80       0      43       **
** 8/23/81      730      .0      .0      .0       0       0       0       0       0       0   C   **
** 8/23/81      745  6700.0     6.5     8.0       6      66       7      82       2      44       **
** 8/23/81      800  6700.0     6.5     8.0       6      67       7      83       2      45       **
** 8/23/81      815  6700.0     6.5     8.0       6      67       7      83       2      45       **
** 8/23/81      830  6700.0     6.9     7.7       6      66       7      84       2      45       **
** 8/23/81      845  6700.0     6.9     7.8       6      66       7      84       2      45       **
** 8/23/81      900  6700.0     6.8     7.9       6      66       7      83       2      45       **
** 8/23/81      915  6700.0     6.8     7.9       5      67       6      85       2      46       **
** 8/23/81      930  6700.0     6.8     7.9       5      67       6      85       2      46       **
** 8/23/81      945  6700.0     6.7     7.9       5      67       6      84       2      45       **
** 8/23/81     1000  6700.0     7.0     7.7       6      66       7      84       2      46       **
** 8/23/81     1015  6700.0     7.0     7.7       5      67       6      86       2      46       **
** 8/23/81     1030  6700.0     6.8     7.8       5      67       6      85       2      46       **
** 8/23/81     1045  6700.0     6.8     7.9       5      67       6      85       2      46       **
** 8/23/81     1100  6700.0     6.9     6.8       5      67       6      85       2      46       **
** 8/23/81     1115  6700.0     6.9     7.8       5      67       6      85       2      46       **
** 8/23/81     1130  6700.0     6.7     7.9       5      67       6      84       2      45       **
** 8/23/81     1145  6700.0     6.6     8.0       5      68       6      85       2      46       **
** 8/23/81     1200  6700.0     6.8     7.9       4      67       5      85       1      46       **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/23/81	1215	6700.0	6.8	7.9	5	67	6	85	2	46	
8/23/81	1230	6700.0	7.0	7.8	4	67	5	86	1	46	
8/23/81	1245	6700.0	6.9	7.8	4	67	5	85	1	46	
8/23/81	1300	6700.0	6.7	7.9	4	67	5	84	1	45	
8/23/81	1315	6700.0	6.8	7.9	3	67	3	85	1	46	
8/23/81	1330	6700.0	6.8	7.9	4	67	5	85	1	46	
8/23/81	1345	6700.0	6.9	7.8	4	67	5	85	1	46	
8/23/81	1400	6700.0	6.2	8.2	4	68	4	82	1	44	
8/23/81	1415	6700.0	6.8	7.9	4	68	5	86	1	46	
8/23/81	1430	6700.0	7.0	7.8	4	67	5	86	1	46	
8/23/81	1445	6700.0	6.8	7.8	4	68	5	86	1	46	
8/23/81	1500	6700.0	6.9	7.8	4	67	5	85	1	46	
8/23/81	1515	6700.0	6.9	7.8	5	67	6	85	2	46	
8/23/81	1530	.0	.0	.0	0	0	0	0	0	0	C
8/23/81	1545	6700.0	6.5	8.1	7	69	8	85	2	46	
8/23/81	1600	6700.0	6.4	8.1	7	69	8	85	2	46	
8/23/81	1615	6700.0	6.4	8.1	7	70	8	86	2	46	
8/23/81	1630	6700.0	6.4	8.1	7	70	8	86	2	46	
8/23/81	1645	6700.0	6.3	8.1	8	70	9	85	3	46	
8/23/81	1700	6700.0	6.3	8.2	7	70	8	85	2	46	
8/23/81	1715	6700.0	6.4	8.1	8	69	9	85	3	46	
8/23/81	1730	6700.0	6.5	8.0	7	69	8	85	2	46	
8/23/81	1745	6700.0	6.4	8.1	7	70	8	86	2	46	
8/23/81	1800	6700.0	6.3	8.2	7	70	8	85	2	46	
8/23/81	1815	6700.0	6.3	8.1	7	69	8	84	2	45	
8/23/81	1830	6700.0	6.6	8.0	7	69	8	86	2	46	
8/23/81	1845	6700.0	6.4	8.1	7	69	8	85	2	46	
8/23/81	1900	6700.0	6.3	8.1	7	69	8	84	2	45	
8/23/81	1915	6700.0	6.4	8.1	8	69	9	85	3	46	
8/23/81	1930	6700.0	6.6	8.2	16	71	20	88	6	48	
8/23/81	1945	6700.0	6.4	8.4	16	71	19	87	6	47	
8/23/81	2000	6700.0	6.3	8.4	16	71	19	87	6	47	
8/23/81	2015	6700.0	6.5	8.3	17	71	21	88	6	47	
8/23/81	2030	6700.0	6.5	8.2	17	70	21	87	6	47	
8/23/81	2045	6700.0	6.3	8.4	17	71	20	87	6	47	
8/23/81	2100	6700.0	6.5	8.3	18	71	22	88	7	47	
8/23/81	2115	6700.0	6.6	8.6	18	71	22	88	7	48	
8/23/81	2130	6700.0	6.1	8.5	17	71	20	85	6	46	
8/23/81	2145	6700.0	6.3	8.4	18	71	22	87	7	47	
8/23/81	2200	6700.0	6.1	8.5	17	71	20	85	6	46	
8/23/81	2215	6700.0	6.1	8.5	17	71	20	85	6	46	
8/23/81	2230	6700.0	6.5	8.3	17	70	21	87	6	47	
8/23/81	2245	6700.0	6.4	8.4	17	71	20	87	6	47	
8/23/81	2300	6700.0	6.4	8.4	17	71	20	87	6	47	
8/23/81	2315	6700.0	6.3	8.5	17	71	20	87	6	47	
8/23/81	2330	.0	.0	.0	0	0	0	0	0	0	C
8/23/81	2345	6700.0	6.5	7.0	1	68	1	84	0	45	
8/23/81	2400	6700.0	6.6	6.9	2	68	2	85	0	46	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/24/81	15	7150.0	6.6	6.9	1	68	1	85	0	46	
8/24/81	30	7150.0	6.4	7.1	1	69	1	85	0	46	
8/24/81	45	7150.0	6.5	7.0	1	68	1	84	0	45	
8/24/81	100	7150.0	6.5	7.0	1	68	1	84	0	45	
8/24/81	115	7150.0	6.6	7.0	1	68	1	85	0	46	
8/24/81	130	7150.0	6.5	7.0	1	68	1	84	0	45	
8/24/81	145	7150.0	6.4	7.1	1	68	1	83	0	45	
8/24/81	200	7150.0	6.2	7.2	1	69	1	84	0	45	
8/24/81	215	7150.0	6.3	7.1	1	68	1	83	0	45	
8/24/81	230	7150.0	6.4	7.1	1	67	1	82	0	44	
8/24/81	245	7150.0	6.5	7.0	1	68	1	84	0	45	
8/24/81	300	7150.0	6.4	7.1	1	68	1	83	0	45	
8/24/81	315	7150.0	6.2	7.1	1	68	1	82	0	44	
8/24/81	330	7150.0	6.2	7.2	1	68	1	82	0	44	
8/24/81	345	7150.0	6.4	7.1	1	67	1	82	0	44	
8/24/81	400	7150.0	6.4	7.1	1	67	1	82	0	44	
8/24/81	415	7150.0	6.1	7.2	1	68	1	82	0	44	
8/24/81	430	7150.0	6.4	7.0	2	67	2	82	0	44	
8/24/81	445	7150.0	6.6	7.0	1	67	1	83	0	45	
8/24/81	500	7150.0	6.9	6.8	1	67	1	85	0	46	
8/24/81	515	7150.0	6.9	6.8	2	66	2	84	0	45	
8/24/81	530	7150.0	6.6	6.9	2	68	2	85	0	46	
8/24/81	545	7150.0	6.5	7.0	2	68	2	84	0	45	
8/24/81	600	7150.0	6.5	7.0	2	68	2	84	0	45	
8/24/81	615	7150.0	6.7	6.9	2	67	2	84	0	45	
8/24/81	630	7150.0	6.9	6.8	1	67	1	85	0	46	
8/24/81	645	7150.0	6.9	6.8	2	66	2	84	0	45	
8/24/81	700	7150.0	7.0	6.7	2	66	2	84	0	46	
8/24/81	715	7150.0	6.8	6.6	1	65	1	82	0	44	
8/24/81	730	.0	.0	.0	0	0	0	0	0	0	C
8/24/81	745	7150.0	7.2	7.8	15	67	19	87	6	47	
8/24/81	800	7150.0	7.3	7.7	15	67	19	88	6	47	
8/24/81	815	7150.0	7.4	7.7	15	66	19	87	6	47	
8/24/81	830	7150.0	7.5	7.6	15	66	20	88	6	47	
8/24/81	845	7150.0	7.6	7.5	14	67	18	90	6	48	
8/24/81	900	7150.0	7.6	7.5	14	66	18	88	6	48	
8/24/81	915	7150.0	7.6	7.5	14	66	18	88	6	48	
8/24/81	930	7150.0	7.5	7.6	14	67	18	89	6	48	
8/24/81	945	7150.0	7.5	7.6	14	68	18	90	6	49	
8/24/81	1000	7150.0	8.2	7.2	13	67	18	94	6	51	
8/24/81	1015	7150.0	8.1	7.2	13	67	18	93	5	50	
8/24/81	1030	7150.0	7.7	7.5	13	68	17	92	5	50	
8/24/81	1045	.0	.0	.0	0	0	0	0	0	0	J
8/24/81	1100	.0	.0	.0	0	0	0	0	0	0	J
8/24/81	1115	7150.0	7.6	7.6	11	72	14	96	4	52	
8/24/81	1130	7150.0	7.7	7.6	10	71	13	96	4	52	
8/24/81	1145	7150.0	8.1	7.3	11	70	15	97	5	53	
8/24/81	1200	7150.0	7.9	7.4	10	70	13	96	4	52	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/24/81	1215	7150.0	7.6	7.6	8	72	10	96	3	52	
8/24/81	1230	7150.0	7.0	8.0	10	73	12	94	4	50	
8/24/81	1245	7150.0	8.1	7.4	9	71	12	99	4	53	
8/24/81	1300	.0	.0	.0	0	0	0	0	0	0	J
8/24/81	1315	.0	.0	.0	0	0	0	0	0	0	J
8/24/81	1330	7150.0	7.0	8.0	9	73	11	94	3	50	
8/24/81	1345	7150.0	6.9	8.1	9	74	11	94	3	51	
8/24/81	1400	7150.0	7.0	8.0	8	73	10	94	3	50	
8/24/81	1415	7150.0	7.2	7.9	9	72	11	94	3	51	
8/24/81	1430	7150.0	7.3	7.9	9	73	11	96	3	52	
8/24/81	1445	7150.0	6.9	8.1	9	74	11	94	3	51	
8/24/81	1500	7150.0	6.6	8.2	10	74	12	92	4	50	
8/24/81	1515	7150.0	6.4	8.3	10	75	12	92	4	50	
8/24/81	1530	7150.0	6.7	8.1	10	75	12	94	4	51	
8/24/81	1545	7150.0	6.7	8.1	11	75	13	94	4	51	
8/24/81	1600	7150.0	6.9	8.0	10	75	12	95	4	52	
8/24/81	1615	7150.0	7.2	7.8	10	74	13	96	4	52	
8/24/81	1630	7150.0	7.3	7.7	10	74	13	97	4	52	
8/24/81	1645	7150.0	7.6	7.5	10	73	13	98	4	53	
8/24/81	1700	7150.0	7.4	7.7	10	73	13	96	4	52	
8/24/81	1715	7150.0	7.5	7.6	10	73	13	97	4	52	
8/24/81	1730	7150.0	7.6	7.5	9	72	12	96	3	52	
8/24/81	1745	7150.0	7.8	7.4	10	71	13	97	4	52	
8/24/81	1800	7150.0	7.6	7.5	10	71	13	95	4	51	
8/24/81	1815	7150.0	7.7	7.5	9	71	12	96	4	52	
8/24/81	1830	7150.0	7.6	7.5	10	71	13	95	4	51	
8/24/81	1845	7150.0	7.7	7.5	10	71	13	96	4	52	
8/24/81	1900	7150.0	7.2	7.8	10	72	13	94	4	51	
8/24/81	1915	.0	.0	.0	0	0	0	0	0	0	C
8/24/81	1930	7150.0	7.0	7.8	14	74	18	95	5	51	
8/24/81	1945	7150.0	7.8	7.5	13	69	17	94	5	51	
8/24/81	2000	7150.0	7.7	7.6	14	69	18	93	6	50	
8/24/81	2015	7150.0	7.7	7.6	15	69	20	93	6	50	
8/24/81	2030	7150.0	7.3	7.8	15	71	19	93	6	50	
8/24/81	2045	7150.0	7.5	7.7	16	70	21	93	7	50	
8/24/81	2100	7150.0	7.7	7.6	15	70	20	94	6	51	
8/24/81	2115	7150.0	7.6	7.7	15	71	20	95	6	51	
8/24/81	2130	7150.0	7.4	7.8	16	71	21	94	6	51	
8/24/81	2145	7150.0	7.3	7.8	16	71	21	93	6	50	
8/24/81	2200	7150.0	7.3	7.9	15	72	19	94	6	51	
8/24/81	2215	7150.0	7.5	7.7	16	72	21	96	7	52	
8/24/81	2230	7150.0	7.2	7.9	16	73	20	95	6	51	
8/24/81	2245	7150.0	6.9	8.1	16	73	20	93	6	50	
8/24/81	2300	7150.0	7.0	8.0	16	73	20	94	6	50	
8/24/81	2315	7150.0	7.0	8.0	16	72	20	92	6	50	
8/24/81	2330	7150.0	7.2	7.9	15	71	19	92	6	50	
8/24/81	2345	7150.0	7.2	7.9	15	72	19	94	6	51	
8/24/81	2400	7150.0	7.1	8.0	15	71	19	92	6	49	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/25/81	15	7150.0	7.4	7.8	15	70	19	92	6	50	
8/25/81	30	7150.0	7.5	7.8	15	69	20	92	6	50	
8/25/81	45	7150.0	7.4	7.8	15	70	19	92	6	50	
8/25/81	100	7150.0	7.2	7.9	15	69	19	90	6	48	
8/25/81	115	7150.0	7.4	7.8	15	68	19	90	6	48	
8/25/81	130	7150.0	6.8	8.2	15	69	19	87	6	47	
8/25/81	145	7150.0	6.3	8.4	15	70	18	85	6	46	
8/25/81	200	7150.0	6.9	8.1	16	69	20	88	6	47	
8/25/81	215	7150.0	6.9	8.0	15	70	19	89	6	48	
8/25/81	230	7150.0	6.8	8.1	15	70	19	88	6	48	
8/25/81	245	7150.0	6.9	8.1	16	69	20	88	6	47	
8/25/81	300	7150.0	6.7	8.2	16	69	20	86	6	47	
8/25/81	315	.0	.0	.0	0	0	0	0	0	0	C
8/25/81	330	7150.0	7.3	7.9	11	67	14	88	4	47	
8/25/81	345	7150.0	7.1	8.1	11	68	14	88	4	47	
8/25/81	400	7150.0	7.3	8.0	11	67	14	88	4	47	
8/25/81	415	7150.0	7.5	7.8	11	66	14	88	4	47	
8/25/81	430	7150.0	7.3	8.0	11	67	14	88	4	47	
8/25/81	445	7150.0	7.2	8.0	11	68	14	88	4	48	
8/25/81	500	7150.0	7.1	8.1	11	68	14	88	4	47	
8/25/81	515	7150.0	7.3	8.0	11	67	14	88	4	47	
8/25/81	530	7150.0	7.4	7.9	11	67	14	88	4	48	
8/25/81	545	7150.0	7.4	7.9	11	67	14	88	4	48	
8/25/81	600	7150.0	7.2	8.0	11	68	14	88	4	48	
8/25/81	615	7150.0	7.3	8.0	11	67	14	88	4	47	
8/25/81	630	7150.0	7.5	7.8	10	67	13	89	4	48	
8/25/81	645	7150.0	7.3	7.9	10	68	13	89	4	48	
8/25/81	700	7150.0	7.5	7.8	10	67	13	89	4	48	
8/25/81	715	7150.0	8.0	7.5	10	66	13	91	4	49	
8/25/81	730	7150.0	7.8	7.7	10	67	13	91	4	49	
8/25/81	745	7150.0	7.8	7.7	10	67	13	91	4	49	
8/25/81	800	7150.0	12.8	3.7	112	26	247	57	81	31	
8/25/81	815	7150.0	9.1	7.0	24	46	36	69	11	37	
8/25/81	830	7150.0	4.3	10.0	12	76	12	81	4	44	
8/25/81	845	7150.0	3.7	10.5	12	78	12	81	4	44	
8/25/81	900	7150.0	3.5	10.6	12	79	12	81	4	44	
8/25/81	915	7150.0	9.2	6.8	26	46	39	70	13	38	
8/25/81	930	7150.0	14.0	4.1	59	13	153	33	50	18	
8/25/81	945	7150.0	11.8	5.3	11	40	21	78	7	42	
8/25/81	1000	7150.0	10.2	6.1	7	56	11	93	3	50	
8/25/81	1015	7150.0	8.8	7.1	8	64	11	94	3	51	
8/25/81	1030	7150.0	6.4	8.7	8	75	9	92	3	50	
8/25/81	1045	7150.0	5.3	9.3	9	80	10	91	3	49	
8/25/81	1100	7150.0	4.7	9.8	10	83	11	91	3	49	
8/25/81	1115	.0	.0	.0	0	0	0	0	0	0	C
8/25/81	1130	7150.0	7.1	8.1	13	76	16	98	5	53	
8/25/81	1145	7150.0	7.0	8.1	14	75	18	96	5	52	
8/25/81	1200	7150.0	7.1	8.1	13	73	16	94	5	51	

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**                        PETROLEUM PROCESS HEATER, LOW NOX BURNERS                                **
**                                         15 MIN. DATA                                            **
**                              DRY STACK GAS CONCENTRATION                                        **
**                              O2     CO2    CO     NO     CO     NO     CO     NO   ACODE        **
**                     LOAD    VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J               **
**   DATE     TIME      B/D    MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                             **
*****************************************************************************************************
** 8/25/81    1215   7150.0    7.2    8.1     13     74     16     96      5     52               **
** 8/25/81    1230   7150.0    7.1    8.1     12     74     15     95      5     52               **
** 8/25/81    1245   7150.0    6.8    8.3     12     75     15     95      5     51               **
** 8/25/81    1300   7150.0    7.1    8.1     12     75     15     97      5     52               **
** 8/25/81    1315   7150.0    7.1    8.1     12     76     15     98      5     53               **
** 8/25/81    1330   7150.0    6.6    8.3      7     77      8     96      2     52               **
** 8/25/81    1345   7150.0    6.7    8.1      4     76      5     95      1     51               **
** 8/25/81    1400   7150.0    6.9    8.0      4     75      5     95      1     52               **
** 8/25/81    1415   7150.0    6.9    8.0      4     75      5     95      1     52               **
** 8/25/81    1430   7150.0    7.0    7.9      4     76      5     97      1     53               **
** 8/25/81    1445   7150.0    6.3    8.3      5     76      6     93      2     50               **
** 8/25/81    1500   7150.0    5.7    8.6      5     77      5     90      1     49               **
** 8/25/81    1515   7150.0    6.3    8.3      5     77      6     94      2     51               **
** 8/25/81    1530   7150.0    6.4    8.2      6     77      7     95      2     51               **
** 8/25/81    1545   7150.0    6.5    8.1      6     76      7     94      2     51               **
** 8/25/81    1600   7150.0    6.5    8.1      6     76      7     94      2     51               **
** 8/25/81    1615   7150.0    6.6    8.1      7     76      8     95      2     51               **
** 8/25/81    1630   7150.0    6.5    8.2      7     76      8     94      2     51               **
** 8/25/81    1645   7150.0    6.4    8.2      7     77      8     95      2     51               **
** 8/25/81    1700   7150.0    6.5    8.1      7     77      8     95      2     51               **
** 8/25/81    1715   7150.0    6.7    8.0      7     76      8     95      2     51               **
** 8/25/81    1730   7150.0    6.7    8.0      6     76      7     95      2     51               **
** 8/25/81    1745   7150.0    6.6    8.1      7     76      8     95      2     51               **
** 8/25/81    1800   7150.0    6.6    8.0      7     75      8     93      2     50               **
** 8/25/81    1815   7150.0    6.7    8.0      6     76      7     95      2     51               **
** 8/25/81    1830   7150.0    6.6    8.1      7     77      8     96      2     52               **
** 8/25/81    1845   7150.0    6.5    8.1      7     77      8     95      2     51               **
** 8/25/81    1900   7150.0    6.6    8.1      6     77      7     96      2     52               **
** 8/25/81    1915       .0     .0     .0      0      0      0      0      0      0    C          **
** 8/25/81    1930   7150.0    6.5    8.1      6     76      7     94      2     51               **
** 8/25/81    1945   7150.0    6.9    7.9      6     75      7     95      2     52               **
** 8/25/81    2000   7150.0    7.1    7.8      6     75      7     97      2     52               **
** 8/25/81    2015   7150.0    6.8    8.0      7     75      8     95      2     51               **
** 8/25/81    2030   7150.0    6.9    7.9      7     75      8     95      2     52               **
** 8/25/81    2045   7150.0    7.2    7.8      7     75      9     97      3     53               **
** 8/25/81    2100   7150.0    7.1    7.9      7     72      9     93      2     50               **
** 8/25/81    2115   7150.0    7.1    7.9      7     70      9     90      2     49               **
** 8/25/81    2130   7150.0    7.2    7.8      7     70      9     91      3     49               **
** 8/25/81    2145   7150.0    7.1    7.9      7     69      9     89      2     48               **
** 8/25/81    2200   7150.0    6.8    8.0      7     68      8     86      2     46               **
** 8/25/81    2215   7150.0    6.9    7.9      7     67      8     85      2     46               **
** 8/25/81    2230   7150.0    7.1    7.9      7     67      9     86      2     47               **
** 8/25/81    2245   7150.0    6.7    8.1      7     68      8     85      2     46               **
** 8/25/81    2300   7150.0    6.9    8.0      8     68     10     86      3     47               **
** 8/25/81    2315   7150.0    6.7    8.1      8     67     10     84      3     45               **
** 8/25/81    2330   7150.0    6.6    8.2      8     67     10     83      3     45               **
** 8/25/81    2345   7150.0    6.8    8.1      8     68     10     86      3     46               **
** 8/25/81    2400   7150.0    6.6    8.2      8     68     10     85      3     46               **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/26/81	15	6750.0	6.7	8.1	8	67	10	84	3	45	
8/26/81	30	6750.0	6.6	8.2	8	69	10	86	3	46	
8/26/81	45	6750.0	6.4	8.3	9	69	11	85	3	46	
8/26/81	100	6750.0	5.8	8.6	8	70	9	82	3	45	
8/26/81	115	6750.0	5.9	8.5	8	70	9	83	3	45	
8/26/81	130	6750.0	6.2	8.4	8	69	9	84	3	45	
8/26/81	145	6750.0	5.8	8.6	8	70	9	82	3	45	
8/26/81	200	6750.0	6.6	8.1	8	69	10	86	3	46	
8/26/81	215	6750.0	6.7	8.1	8	69	10	86	3	47	
8/26/81	230	6750.0	6.6	8.1	8	69	10	86	3	46	
8/26/81	245	6750.0	6.8	8.0	8	68	10	86	3	46	
8/26/81	300	6750.0	6.5	8.3	8	68	9	84	3	45	
8/26/81	315	.0	.0	.0	0	0	0	0	0	0	C
8/26/81	330	6750.0	6.5	8.1	4	67	4	83	1	45	
8/26/81	345	6750.0	6.6	8.0	3	66	3	82	1	44	
8/26/81	400	6750.0	6.2	8.3	3	67	3	81	1	44	
8/26/81	415	6750.0	6.2	8.3	4	67	4	81	1	44	
8/26/81	430	6750.0	6.6	8.1	3	67	3	83	1	45	
8/26/81	445	6750.0	6.4	8.2	3	67	3	82	1	44	
8/26/81	500	6750.0	6.2	8.3	3	68	3	82	1	44	
8/26/81	515	6750.0	6.7	8.0	3	66	3	83	1	45	
8/26/81	530	6750.0	6.6	8.0	3	66	3	82	1	44	
8/26/81	545	6750.0	6.4	8.1	3	66	3	81	1	44	
8/26/81	600	6750.0	6.7	8.0	3	66	3	83	1	45	
8/26/81	615	6750.0	6.9	7.9	3	65	3	83	1	45	
8/26/81	630	6750.0	6.9	7.9	3	65	3	83	1	45	
8/26/81	645	6750.0	7.0	7.8	3	65	3	83	1	45	
8/26/81	700	6750.0	7.0	7.8	3	65	3	83	1	45	
8/26/81	715	6750.0	7.0	7.8	3	65	3	83	1	45	
8/26/81	730	6750.0	7.0	7.8	3	65	3	83	1	45	
8/26/81	745	6750.0	7.2	7.6	3	67	3	87	1	47	
8/26/81	800	6750.0	7.4	7.6	3	66	3	87	1	47	
8/26/81	815	6750.0	7.3	7.5	3	66	3	86	1	47	
8/26/81	830	6750.0	7.6	7.4	3	66	4	88	1	48	
8/26/81	845	6211.0	7.4	7.6	3	67	3	88	1	48	
8/26/81	900	6211.0	7.3	7.6	3	68	3	89	1	48	
8/26/81	915	6211.0	7.0	7.7	3	68	3	87	1	47	
8/26/81	930	6211.0	7.3	7.6	3	69	3	90	1	49	
8/26/81	945	6211.0	7.2	7.7	3	70	3	91	1	49	
8/26/81	1000	6220.0	7.6	7.4	2	68	2	91	0	49	
8/26/81	1015	6220.0	7.3	7.6	3	69	3	90	1	49	
8/26/81	1030	6220.0	7.1	7.8	2	71	2	92	0	49	
8/26/81	1045	6220.0	7.1	7.7	2	72	2	93	0	50	
8/26/81	1100	6220.0	7.3	7.7	2	73	2	96	0	52	
8/26/81	1115	.0	.0	.0	0	0	0	0	0	0	C
8/26/81	1130	6220.0	7.3	7.7	5	72	6	94	2	51	
8/26/81	1145	6220.0	7.3	7.7	5	71	6	93	2	50	
8/26/81	1200	6220.0	7.0	7.8	5	72	6	92	2	50	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/26/81	1215	6215.0	6.9	8.0	5	74	6	94	2	51	
8/26/81	1230	6215.0	6.5	8.2	5	74	6	91	2	49	
8/26/81	1245	6215.0	6.6	8.1	5	74	6	92	2	50	
8/26/81	1300	6215.0	6.5	8.1	5	75	6	93	2	50	
8/26/81	1315	6215.0	6.6	8.2	5	75	6	93	2	50	
8/26/81	1330	6215.0	6.8	8.0	4	75	5	95	1	51	
8/26/81	1345	.0	.0	.0	0	0	0	0	0	0	J
8/26/81	1400	.0	.0	.0	0	0	0	0	0	0	J
8/26/81	1415	.0	.0	.0	0	0	0	0	0	0	J
8/26/81	1430	6215.0	5.6	8.5	5	79	5	92	1	50	
8/26/81	1445	6215.0	5.7	8.5	7	78	8	91	2	49	
8/26/81	1500	6215.0	6.0	8.3	6	80	7	96	2	52	
8/26/81	1515	6215.0	6.2	8.3	6	81	7	98	2	53	
8/26/81	1530	6215.0	6.1	8.3	6	81	7	97	2	53	
8/26/81	1545	6215.0	6.2	8.2	6	80	7	97	2	52	
8/26/81	1600	6215.0	5.9	8.4	6	81	7	96	2	52	
8/26/81	1615	6215.0	6.0	8.3	6	79	7	94	2	51	
8/26/81	1630	6215.0	6.2	8.2	7	78	8	94	2	51	
8/26/81	1645	6215.0	6.5	8.0	6	77	7	95	2	51	
8/26/81	1700	6215.0	6.3	8.2	7	77	8	94	2	51	
8/26/81	1715	6215.0	6.1	8.3	7	77	8	93	2	50	
8/26/81	1730	6215.0	6.3	8.2	6	77	7	94	2	51	
8/26/81	1745	6215.0	6.3	8.2	7	77	8	94	2	51	
8/26/81	1800	6215.0	6.3	8.2	7	77	8	94	2	51	
8/26/81	1815	6215.0	6.5	8.0	6	77	7	95	2	51	
8/26/81	1830	6215.0	6.4	8.1	7	76	8	93	2	50	
8/26/81	1845	6215.0	6.4	8.1	7	76	8	93	2	50	
8/26/81	1900	6215.0	6.3	8.2	6	77	7	94	2	51	
8/26/81	1915	.0	.0	.0	0	0	0	0	0	0	C
8/26/81	1930	6215.0	5.9	8.5	7	77	8	91	2	49	
8/26/81	1945	6215.0	6.6	8.1	6	76	7	95	2	51	
8/26/81	2000	6215.0	6.8	8.0	7	76	8	96	2	52	
8/26/81	2015	6215.0	6.6	8.1	7	75	8	93	2	50	
8/26/81	2030	6215.0	6.5	8.2	7	76	8	94	2	51	
8/26/81	2045	6215.0	6.7	8.0	7	75	8	94	2	51	
8/26/81	2100	6215.0	6.4	8.2	7	75	8	92	2	50	
8/26/81	2115	6215.0	6.6	8.1	7	76	8	95	2	51	
8/26/81	2130	6215.0	6.5	8.2	8	76	9	94	3	51	
8/26/81	2145	6215.0	5.9	8.5	8	76	9	90	3	49	
8/26/81	2200	6215.0	6.1	8.4	7	76	8	91	2	49	
8/26/81	2215	6215.0	6.7	8.1	7	74	8	93	2	50	
8/26/81	2230	6215.0	6.5	8.2	7	74	8	91	2	49	
8/26/81	2245	6215.0	6.4	8.2	7	73	8	90	2	48	
8/26/81	2300	6215.0	6.6	8.1	7	72	8	90	2	48	
8/26/81	2315	6215.0	6.6	8.1	7	71	8	88	2	48	
8/26/81	2330	6215.0	6.5	8.2	7	72	8	89	2	48	
8/26/81	2345	6215.0	6.6	8.1	8	72	10	90	3	48	
8/26/81	2400	6215.0	6.6	8.1	8	71	10	88	3	48	

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**                         PETROLEUM PROCESS HEATER, LOW NOX BURNERS                    **
**                                        15 MIN. DATA                                  **
**                                DRY STACK GAS CONCENTRATION                           **
**                              O2       CO2      CO       NO       CO       NO       CO       NO   ACODE   **
**                      LOAD   VOL%     VOL%     PPMV     PPMV     PPMV     PPMV     NG/J     NG/J          **
**    DATE     TIME     B/D    MEAS     MEAS     MEAS     MEAS     3%O2     3%O2                            **
******************************************************************************************
** 8/27/81     15   6215.0     6.6      8.1        8       71       10       88        3       48           **
** 8/27/81     30   6215.0     6.7      8.1        8       71       10       89        3       48           **
** 8/27/81     45   6215.0     6.6      8.1        8       71       10       88        3       48           **
** 8/27/81    100   6215.0     6.3      8.3        8       71        9       87        3       47           **
** 8/27/81    115   6215.0     6.5      8.2        8       71        9       88        3       47           **
** 8/27/81    130   6215.0     6.6      8.1        8       71       10       88        3       48           **
** 8/27/81    145   6215.0     6.4      8.2        8       71        9       87        3       47           **
** 8/27/81    200   6215.0     6.6      8.1        8       70       10       87        3       47           **
** 8/27/81    215   6215.0     6.5      8.2        8       70        9       87        3       47           **
** 8/27/81    230   6215.0     6.2      8.4        9       71       10       86        3       46           **
** 8/27/81    245   6215.0     6.1      8.4        9       70       10       84        3       45           **
** 8/27/81    300   6215.0     6.2      8.3        9       70       10       85        3       46           **
** 8/27/81    315       .0      .0       .0        0        0        0        0        0        0   C       **
** 8/27/81    330   6215.0     6.1      8.2        3       69        3       83        1       45           **
** 8/27/81    345   6215.0     6.4      8.1        3       68        3       83        1       45           **
** 8/27/81    400   6215.0     6.8      7.8        3       66        3       83        1       45           **
** 8/27/81    415   6215.0     6.1      8.3        3       69        3       83        1       45           **
** 8/27/81    430   6215.0     5.9      8.4        2       69        2       82        0       44           **
** 8/27/81    445   6215.0     6.1      8.3        3       69        3       83        1       45           **
** 8/27/81    500   6215.0     6.1      8.3        3       69        3       83        1       45           **
** 8/27/81    515   6215.0     6.3      8.1        3       69        3       84        1       45           **
** 8/27/81    530   6215.0     6.6      8.0        3       68        3       85        1       46           **
** 8/27/81    545   6215.0     6.3      8.2        3       68        3       83        1       45           **
** 8/27/81    600   6215.0     6.5      8.1        2       67        2       83        0       45           **
** 8/27/81    615   6215.0     6.3      8.2        2       68        2       83        0       45           **
** 8/27/81    630   6215.0     6.6      7.9        2       67        2       83        0       45           **
** 8/27/81    645   6215.0     6.9      7.8        2       67        2       85        0       46           **
** 8/27/81    700   6215.0     7.0      7.6        2       66        2       84        0       46           **
** 8/27/81    715   6215.0     6.8      7.8        2       67        2       85        0       46           **
** 8/27/81    730   6215.0     6.9      7.7        2       67        2       85        0       46           **
** 8/27/81    745   6215.0     6.8      7.9        2       67        2       85        0       46           **
** 8/27/81    800   6215.0     7.1      7.6        2       66        2       85        0       46           **
** 8/27/81    815   6215.0     7.1      7.6        2       66        2       85        0       46           **
** 8/27/81    830   6215.0     7.3      7.5        2       65        2       85        0       46           **
** 8/27/81    845   6215.0     7.3      7.5        2       65        2       85        0       46           **
** 8/27/81    900   6215.0     7.3      7.5        2       66        2       86        0       47           **
** 8/27/81    915   6215.0     6.8      7.8        6       68        7       86        2       46           **
** 8/27/81    930   6215.0     6.8      7.8        2       68        2       86        0       46           **
** 8/27/81    945   6215.0     7.0      7.8        1       67        1       86        0       46           **
** 8/27/81   1000   6215.0     7.0      7.8        1       68        1       87        0       47           **
** 8/27/81   1015   6215.0     6.8      7.8        1       68        1       86        0       46           **
** 8/27/81   1030   6215.0     7.0      7.8        1       69        1       88        0       48           **
** 8/27/81   1045   6215.0     7.2      7.6        1       69        1       90        0       48           **
** 8/27/81   1100       .0      .0       .0        0        0        0        0        0        0   J       **
** 8/27/81   1115       .0      .0       .0        0        0        0        0        0        0   J       **
** 8/27/81   1130       .0      .0       .0        0        0        0        0        0        0   J       **
** 8/27/81   1145       .0      .0       .0        0        0        0        0        0        0   J       **
** 8/27/81   1200       .0      .0       .0        0        0        0        0        0        0   J       **
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**                           PETROLEUM PROCESS HEATER, LOW NOX BURNERS                            **
**                                       15 MIN. DATA                                              **
**                                DRY STACK GAS CONCENTRATION                                      **
**                             O2     CO2     CO      NO      CO      NO      CO      NO   ACODE   **
**                     LOAD   VOL%   VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J          **
**   DATE     TIME      B/D   MEAS   MEAS    MEAS    MEAS    3%O2    3%O2                          **
*****************************************************************************************************
** 8/27/81   1215        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1230        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1245        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1300        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1315        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1330        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1345        .0     .0     .0      0       0       0       0       0       0   J       **
** 8/27/81   1400    6850.0    7.2    7.9      3      82       3     107       1      58           **
** 8/27/81   1415    6850.0    6.8    8.2      4      73       5      92       1      50           **
** 8/27/81   1430    6850.0    6.6    8.3      4      73       5      91       1      49           **
** 8/27/81   1445    6850.0    6.7    8.1      5      72       6      90       2      49           **
** 8/27/81   1500    6850.0    6.6    8.2      5      72       6      90       2      48           **
** 8/27/81   1515    6850.0    6.3    8.4      5      72       6      88       2      47           **
** 8/27/81   1530    6850.0    6.3    8.4      5      73       6      89       2      48           **
** 8/27/81   1545    6850.0    6.2    8.4      6      72       7      87       2      47           **
** 8/27/81   1600    6850.0    6.2    8.4      6      73       7      88       2      48           **
** 8/27/81   1615    6850.0    6.6    8.1      6      71       7      88       2      48           **
** 8/27/81   1630    6850.0    6.5    8.2      7      71       8      88       2      47           **
** 8/27/81   1645    6850.0    6.3    8.3      7      72       8      88       2      47           **
** 8/27/81   1700    6850.0    6.4    8.2      7      72       8      88       2      48           **
** 8/27/81   1715    6850.0    6.3    8.3      7      72       8      88       2      47           **
** 8/27/81   1730    6850.0    6.4    8.2      8      72       9      88       3      48           **
** 8/27/81   1745    6850.0    6.4    8.2      8      72       9      88       3      48           **
** 8/27/81   1800    6850.0    6.3    8.3      8      71       9      87       3      47           **
** 8/27/81   1815    6850.0    6.4    8.2      8      71       9      87       3      47           **
** 8/27/81   1830    6850.0    6.6    8.1      8      70      10      87       3      47           **
** 8/27/81   1845    6850.0    6.9    7.9      8      69      10      88       3      47           **
** 8/27/81   1900        .0     .0     .0      0       0       0       0       0       0   C       **
** 8/27/81   1915    6850.0    6.1    9.1      7      67       8      81       2      43           **
** 8/27/81   1930    6850.0    6.8    8.0      7      69       8      87       2      47           **
** 8/27/81   1945    6850.0    6.6    8.1      7      69       8      86       2      46           **
** 8/27/81   2000    6850.0    7.2    7.5      7      69       9      90       3      48           **
** 8/27/81   2015    6850.0    7.1    8.0      7      70       9      90       2      49           **
** 8/27/81   2030    6850.0    7.1    8.2      7      71       9      92       2      49           **
** 8/27/81   2045    6850.0    6.2    8.4      7      73       8      88       2      48           **
** 8/27/81   2100    6850.0    6.4    8.4      7      73       8      90       2      48           **
** 8/27/81   2115    6850.0    6.4    8.4      7      73       8      90       2      48           **
** 8/27/81   2130    6850.0    6.5    8.3      7      71       8      88       2      47           **
** 8/27/81   2145    6850.0    6.8    8.2      7      69       8      87       2      47           **
** 8/27/81   2200    6850.0    7.1    8.0      8      69      10      89       3      48           **
** 8/27/81   2215    6850.0    7.3    7.8      8      69      10      90       3      49           **
** 8/27/81   2230    6850.0    7.3    7.8      8      69      10      90       3      49           **
** 8/27/81   2245    6850.0    7.1    8.0      8      69      10      89       3      48           **
** 8/27/81   2300    6850.0    7.2    7.9      8      69      10      90       3      48           **
** 8/27/81   2315    6850.0    7.2    7.9      8      69      10      90       3      48           **
** 8/27/81   2330    6850.0    7.3    7.8      8      69      10      90       3      49           **
** 8/27/81   2345    6850.0    7.1    8.0      8      69      10      89       3      48           **
** 8/27/81   2400    6850.0    7.0    8.0      8      70      10      90       3      48           **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/28/81	15	6850.0	6.5	8.3	8	69	9	85	3	46	
8/28/81	30	6850.0	6.6	8.2	8	69	10	86	3	46	
8/28/81	45	6850.0	6.5	8.4	8	69	9	85	3	46	
8/28/81	100	6850.0	6.3	8.6	8	70	9	85	3	46	
8/28/81	115	6850.0	6.2	8.6	8	71	9	86	3	46	
8/28/81	130	6850.0	6.0	8.6	8	71	9	85	3	46	
8/28/81	145	6850.0	6.2	8.4	8	71	9	86	3	46	
8/28/81	200	6850.0	6.6	8.3	8	70	10	87	3	47	
8/28/81	215	6850.0	7.1	8.1	8	69	10	89	3	48	
8/28/81	230	6850.0	7.1	8.2	8	69	10	89	3	48	
8/28/81	245	6850.0	6.8	8.2	8	69	10	87	3	47	
8/28/81	300	6850.0	6.8	8.2	8	69	10	87	3	47	
8/28/81	315	.0	.0	.0	0	0	0	0	0	0	C
8/28/81	330	6850.0	7.1	7.8	7	67	9	86	2	47	
8/28/81	345	6850.0	7.2	7.7	7	67	9	87	3	47	
8/28/81	400	6850.0	7.3	7.8	7	67	9	88	3	47	
8/28/81	415	6850.0	7.0	8.0	7	67	9	86	2	46	
8/28/81	430	6850.0	6.7	8.1	7	67	8	84	2	45	
8/28/81	445	6850.0	6.4	8.4	7	67	8	82	2	44	
8/28/81	500	6850.0	6.6	8.2	7	67	8	83	2	45	
8/28/81	515	6850.0	6.8	7.9	7	67	8	85	2	46	
8/28/81	530	6850.0	7.2	7.8	7	66	9	86	3	46	
8/28/81	545	6850.0	7.5	7.6	7	66	9	88	3	47	
8/28/81	600	6850.0	7.5	7.6	7	66	9	88	3	47	
8/28/81	615	6850.0	7.4	7.7	7	66	9	87	3	47	
8/28/81	630	6850.0	7.4	7.7	7	66	9	87	3	47	
8/28/81	645	6850.0	7.2	7.8	7	66	9	86	3	46	
8/28/81	700	6850.0	7.2	7.8	7	66	9	86	3	46	
8/28/81	715	6850.0	7.2	7.8	7	67	9	87	3	47	
8/28/81	730	6850.0	7.5	7.7	7	66	9	88	3	47	
8/28/81	745	6850.0	7.8	7.4	7	66	9	90	3	48	
8/28/81	800	6850.0	7.8	7.4	7	65	9	88	3	48	
8/28/81	815	6850.0	7.7	7.5	7	65	9	88	3	47	
8/28/81	830	6850.0	7.7	7.5	6	65	8	88	2	47	
8/28/81	845	6850.0	7.8	7.4	6	65	8	88	2	48	
8/28/81	900	6850.0	7.8	7.4	6	65	8	88	2	48	
8/28/81	915	6850.0	7.8	7.4	6	66	8	90	2	48	
8/28/81	930	6850.0	7.8	7.4	6	65	8	88	2	48	
8/28/81	945	6850.0	8.0	7.3	6	66	8	91	2	49	
8/28/81	1000	6850.0	8.1	7.2	5	66	6	92	2	50	
8/28/81	1015	6850.0	8.1	7.1	5	65	6	90	2	49	
8/28/81	1030	6850.0	8.1	7.1	5	66	6	92	2	50	
8/28/81	1045	6850.0	8.1	7.2	5	66	6	92	2	50	
8/28/81	1100	6850.0	8.1	7.1	4	66	5	92	1	50	
8/28/81	1115	.0	.0	.0	0	0	0	0	0	0	C
8/28/81	1130	6850.0	7.8	7.5	8	69	10	94	3	51	
8/28/81	1145	6850.0	7.7	7.6	7	69	9	93	3	50	
8/28/81	1200	6850.0	7.6	7.5	6	76	8	102	2	55	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/28/81	1215	6850.0	7.4	7.8	5	82	6	108	2	58	
8/28/81	1230	6850.0	7.2	7.8	5	76	6	99	2	53	
8/28/81	1245	6850.0	6.9	7.9	5	71	6	90	2	49	
8/28/81	1300	6850.0	7.0	7.8	5	71	6	91	2	49	
8/28/81	1315	6850.0	7.0	7.8	5	71	6	91	2	49	
8/28/81	1330	6850.0	6.7	8.0	5	72	6	90	2	49	
8/28/81	1345	6850.0	6.9	8.1	14	73	17	93	5	50	
8/28/81	1400	6850.0	6.9	8.1	13	71	16	90	5	49	
8/28/81	1415	8500.0	6.8	8.0	6	68	7	86	2	46	
8/28/81	1430	8500.0	6.3	8.2	7	68	8	83	2	45	
8/28/81	1445	8500.0	6.4	8.1	7	68	8	83	2	45	
8/28/81	1500	8500.0	6.1	8.3	8	69	9	83	3	45	
8/28/81	1515	.0	.0	.0	0	0	0	0	0	0	C
8/28/81	1530	8500.0	6.2	8.0	8	72	9	87	3	47	
8/28/81	1545	8500.0	6.9	7.9	8	69	10	88	3	47	
8/28/81	1600	8500.0	7.1	7.7	8	68	10	88	3	47	
8/28/81	1615	8500.0	7.3	7.6	8	68	10	89	3	48	
8/28/81	1630	8500.0	7.1	7.7	7	68	9	88	2	47	
8/28/81	1645	8500.0	6.8	7.9	8	68	10	86	3	46	
8/28/81	1700	8500.0	6.8	7.9	8	68	10	86	3	46	
8/28/81	1715	8500.0	6.7	7.9	8	69	10	86	3	47	
8/28/81	1730	8500.0	6.4	8.1	8	69	9	85	3	46	
8/28/81	1745	8500.0	6.3	8.2	8	69	9	84	3	45	
8/28/81	1800	8500.0	6.6	8.0	8	69	10	86	3	46	
8/28/81	1815	8500.0	6.7	7.9	8	69	10	86	3	47	
8/28/81	1830	8500.0	6.7	8.0	8	69	10	86	3	47	
8/28/81	1845	8500.0	7.0	7.8	8	69	10	88	3	48	
8/28/81	1900	.0	.0	.0	0	0	0	0	0	0	C
8/28/81	1915	8500.0	6.7	7.9	7	69	8	86	2	47	
8/28/81	1930	8500.0	6.7	8.0	7	69	8	86	2	47	
8/28/81	1945	8500.0	6.5	8.1	7	69	8	85	2	46	
8/28/81	2000	8500.0	6.4	8.2	8	69	9	85	3	46	
8/28/81	2015	8500.0	6.7	8.0	8	69	10	86	3	47	
8/28/81	2030	8500.0	6.6	8.1	8	69	10	86	3	46	
8/28/81	2045	8500.0	6.1	8.4	8	70	9	84	3	45	
8/28/81	2100	8500.0	6.1	8.3	8	69	9	83	3	45	
8/28/81	2115	8500.0	6.3	8.3	9	69	11	84	3	45	
8/28/81	2130	8500.0	6.2	8.3	9	69	10	84	3	45	
8/28/81	2145	8500.0	6.6	8.1	8	69	10	86	3	46	
8/28/81	2200	8500.0	6.6	8.1	9	69	11	86	3	46	
8/28/81	2215	8500.0	6.3	8.3	8	69	9	84	3	45	
8/28/81	2230	8500.0	6.0	8.5	8	69	9	82	3	44	
8/28/81	2245	8500.0	6.6	8.1	9	67	11	83	3	45	
8/28/81	2300	8500.0	6.2	8.3	8	67	9	81	3	44	
8/28/81	2315	8500.0	6.1	8.4	8	68	9	82	3	44	
8/28/81	2330	8500.0	6.1	8.4	9	68	10	82	3	44	
8/28/81	2345	8500.0	6.3	8.3	8	68	9	83	3	45	
8/28/81	2400	8500.0	6.7	8.1	8	67	10	84	3	45	

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*****************************************************************************************************
**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                              **
**                                       15 MIN. DATA                                              **
**                               DRY STACK GAS CONCENTRATION                                       **
**                             O2      CO2       CO       NO       CO       NO       CO      NO  ACODE **
**                   LOAD    VOL%     VOL%     PPMV     PPMV     PPMV     PPMV     NG/J    NG/J        **
**   DATE    TIME     B/D    MEAS     MEAS     MEAS     MEAS     3%O2     3%O2                          **
*****************************************************************************************************
** 8/29/81     15  8500.0    6.6      8.1        9       67       11       83        3      45        **
** 8/29/81     30  8500.0    6.4      8.2        9       67       11       82        3      44        **
** 8/29/81     45  8500.0    6.2      8.3        9       67       10       81        3      44        **
** 8/29/81    100  8500.0    6.5      8.2        9       66       11       82        3      44        **
** 8/29/81    115  8500.0    6.6      8.1        9       66       11       82        3      44        **
** 8/29/81    130  8500.0    6.7      8.0        9       67       11       84        3      45        **
** 8/29/81    145  8280.0    6.6      8.1        9       67       11       83        3      45        **
** 8/29/81    200  8280.0    6.7      8.1        9       67       11       84        3      45        **
** 8/29/81    215  8280.0    6.5      8.2        9       67       11       83        3      45        **
** 8/29/81    230  8280.0    6.3      8.3       10       67       12       82        4      44        **
** 8/29/81    245  8280.0    6.5      8.2        9       67       11       83        3      45        **
** 8/29/81    300      .0     .0       .0        0        0        0        0        0       0   C    **
** 8/29/81    315  8880.0    6.6      8.3        4       72        5       90        1      48        **
** 8/29/81    330  8880.0    6.4      8.6        4       73        4       90        1      48        **
** 8/29/81    345  8880.0    6.6      8.3        4       72        5       90        1      48        **
** 8/29/81    400  8880.0    6.8      8.2        4       72        5       91        1      49        **
** 8/29/81    415  8880.0    6.2      8.6        4       73        4       88        1      48        **
** 8/29/81    430  8880.0    5.9      8.8        4       74        4       88        1      47        **
** 8/29/81    445  8880.0    6.0      8.7        4       73        4       87        1      47        **
** 8/29/81    500  8880.0    6.3      8.5        4       72        4       88        1      47        **
** 8/29/81    515  8880.0    6.1      8.6        4       73        4       88        1      47        **
** 8/29/81    530  8880.0    6.3      8.5        4       72        4       88        1      47        **
** 8/29/81    545  8880.0    6.3      8.5        4       72        4       88        1      47        **
** 8/29/81    600  8880.0    6.3      8.6        4       72        4       88        1      47        **
** 8/29/81    615  8880.0    6.3      8.5        4       72        4       88        1      47        **
** 8/29/81    630  8880.0    6.4      8.5        4       72        4       88        1      48        **
** 8/29/81    645  8880.0    6.5      8.4        3       72        3       89        1      48        **
** 8/29/81    700  8880.0    6.5      8.4        3       71        3       88        1      47        **
** 8/29/81    715  8880.0    6.9      8.2        3       71        3       90        1      49        **
** 8/29/81    730  8880.0    6.9      8.1        3       70        3       89        1      48        **
** 8/29/81    745  8880.0    6.9      8.1        3       70        3       89        1      48        **
** 8/29/81    800  8880.0    7.2      8.0        3       70        3       91        1      49        **
** 8/29/81    815  8880.0    6.7      8.3        3       72        3       90        1      49        **
** 8/29/81    830  8880.0    6.3      8.6        3       73        3       89        1      48        **
** 8/29/81    845  8880.0    6.1      8.7        3       74        3       89        1      48        **
** 8/29/81    900  8880.0    6.2      8.7        3       75        3       91        1      49        **
** 8/29/81    915  8880.0    5.8      9.0        3       75        3       88        1      48        **
** 8/29/81    930  8880.0    5.5      9.1        3       75        3       87        1      47        **
** 8/29/81    945  8880.0    5.9      8.9        2       75        2       89        0      48        **
** 8/29/81   1000  8880.0    6.3      8.6        2       74        2       90        0      49        **
** 8/29/81   1015  8880.0    5.6      9.1        2       76        2       88        0      48        **
** 8/29/81   1030  8880.0    5.6      9.1        2       76        2       88        0      48        **
** 8/29/81   1045  8880.0    5.7      9.1        2       75        2       88        0      47        **
** 8/29/81   1100      .0     .0       .0        0        0        0        0        0       0   C    **
** 8/29/81   1115      .0     .0       .0        0        0        0        0        0       0   J    **
** 8/29/81   1130      .0     .0       .0        0        0        0        0        0       0   J    **
** 8/29/81   1145  8880.0    5.1      9.0        6       70        6       79        2      43        **
** 8/29/81   1200  8880.0    4.7      9.3        7       72        7       79        2      43        **
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**                      PETROLEUM PROCESS HEATER, LOW NOX BURNERS                        **
**                                    15 MIN. DATA                                       **
**                             DRY STACK GAS CONCENTRATION                               **
**                          O2    CO2     CO     NO     CO     NO     CO     NO ACODE    **
**                  LOAD  VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J          **
**   DATE   TIME     B/D  MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                        **
*******************************************************************************************
** 8/29/81  1215  8880.0   4.8    9.2      7     72      7     80      2     43          **
** 8/29/81  1230  8880.0   4.8    9.3      7     73      7     81      2     44          **
** 8/29/81  1245  8880.0   4.7    9.3      7     73      7     80      2     43          **
** 8/29/81  1300  8500.0   5.0    9.1      6     70      6     78      2     42          **
** 8/29/81  1315  8500.0   5.2    9.0      6     70      6     79      2     43          **
** 8/29/81  1330  8500.0   4.8    9.3      6     70      6     77      2     42          **
** 8/29/81  1345  8500.0   4.0    9.8     13     69     13     73      4     39          **
** 8/29/81  1400  8500.0   4.0    9.7      6     72      6     76      2     41          **
** 8/29/81  1415  8500.0   4.5    9.4      6     73      6     79      2     43          **
** 8/29/81  1430  8500.0   4.5    9.4      6     73      6     79      2     43          **
** 8/29/81  1445  8500.0   4.6    9.4      6     73      6     80      2     43          **
** 8/29/81  1500  8500.0   4.9    9.1      6     71      6     79      2     43          **
** 8/29/81  1515  8500.0   5.0    9.1      7     70      7     78      2     42          **
** 8/29/81  1530  8500.0   5.0    9.0      7     70      7     78      2     42          **
** 8/29/81  1545  8500.0   5.3    8.9      7     71      8     81      2     44          **
** 8/29/81  1600  8500.0   4.9    9.1      8     72      8     80      2     43          **
** 8/29/81  1615  8500.0   4.7    9.3      8     73      8     80      2     43          **
** 8/29/81  1630  8500.0   4.6    9.0      8     73      8     80      2     43          **
** 8/29/81  1645  8500.0   4.8    9.1      8     73      8     81      2     44          **
** 8/29/81  1700  8500.0   5.0    9.2      8     73      9     82      2     44          **
** 8/29/81  1715  8500.0   5.0    8.9      9     72     10     81      3     43          **
** 8/29/81  1730  8500.0   4.8    8.9      9     72     10     80      3     43          **
** 8/29/81  1745  8500.0   5.0    9.0      9     72     10     81      3     43          **
** 8/29/81  1800  8500.0   4.6    9.0      9     72      9     79      3     42          **
** 8/29/81  1815  8500.0   3.5    9.3      9     74      9     76      3     41          **
** 8/29/81  1830  8500.0   3.4    9.5      9     73      9     74      3     40          **
** 8/29/81  1845  8500.0   3.5   10.2      9     73      9     75      3     40          **
** 8/29/81  1900      .0    .0     .0      0      0      0      0      0      0   C      **
** 8/29/81  1915  8500.0   3.5    9.4      9     71      9     73      3     39          **
** 8/29/81  1930  8500.0   5.0    9.2      9     71     10     79      3     43          **
** 8/29/81  1945  8500.0   5.0    8.9      9     71     10     79      3     43          **
** 8/29/81  2000  8500.0   4.8    9.0      9     73     10     81      3     44          **
** 8/29/81  2015  8500.0   4.5    9.3      9     74      9     80      3     43          **
** 8/29/81  2030  8500.0   4.4    9.3      9     74      9     80      3     43          **
** 8/29/81  2045  8500.0   3.8    9.4      9     75      9     78      3     42          **
** 8/29/81  2100  8500.0   3.8   10.0     10     73     10     76      3     41          **
** 8/29/81  2115  8500.0   5.1    9.2     10     73     11     82      3     44          **
** 8/29/81  2130  8500.0   5.1    9.0     10     74     11     83      3     45          **
** 8/29/81  2145  8500.0   5.0    8.9     10     74     11     83      3     45          **
** 8/29/81  2200  8500.0   5.0    9.0     10     74     11     83      3     45          **
** 8/29/81  2215  8500.0   4.6    9.1     11     73     12     80      3     43          **
** 8/29/81  2230  8500.0   4.5    9.2     11     73     12     79      3     43          **
** 8/29/81  2245  8500.0   4.2    9.4     10     74     10     79      3     43          **
** 8/29/81  2300  8500.0   4.3    9.5     10     74     10     79      3     43          **
** 8/29/81  2315  8500.0   4.8    9.2     10     73     11     81      3     44          **
** 8/29/81  2330  8500.0   4.7    9.3     10     73     11     80      3     43          **
** 8/29/81  2345  8500.0   4.6    9.4     10     73     10     80      3     43          **
** 8/29/81  2400  8500.0   5.0    9.0     10     73     11     82      3     44          **
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**                        PETROLEUM PROCESS HEATER, LOW NOX BURNERS                        **
**                                      15 MIN. DATA                                       **
**                               DRY STACK GAS CONCENTRATION                               **
**                                O2     CO2     CO     NO     CO     NO     CO     NO  ACODE  **
**                         LOAD   VOL%    VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J         **
**    DATE   TIME     B/D   MEAS    MEAS   MEAS   MEAS   3%O2   3%O2                       **
*********************************************************************************************
** 8/30/81     15  8290.0    5.2     8.8     10     73     11     83      3     45         **
** 8/30/81     30  8290.0    5.1     9.1     10     73     11     82      3     44         **
** 8/30/81     45  8290.0    5.1     9.0     10     73     11     82      3     44         **
** 8/30/81    100  8290.0    4.5     9.3     10     73     10     79      3     43         **
** 8/30/81    115  8290.0    4.2     9.8     10     74     10     79      3     43         **
** 8/30/81    130  8290.0    3.9     9.9     11     74     11     77      3     42         **
** 8/30/81    145  8290.0    3.8    10.2     10     74     10     77      3     42         **
** 8/30/81    200  8290.0    3.6    10.3     10     72     10     74      3     40         **
** 8/30/81    215  8290.0    3.9     9.3     11     75     11     78      3     42         **
** 8/30/81    230  8290.0    5.0     9.0     10     75     11     84      3     45         **
** 8/30/81    245  8290.0    4.9     9.2     10     75     11     83      3     45         **
** 8/30/81    300  8290.0    5.0     9.2     10     75     11     84      3     45         **
** 8/30/81    315      .0     .0      .0      0      0      0      0      0      0      C  **
** 8/30/81    330  8290.0    4.3    10.1     10     73     10     78      3     42         **
** 8/30/81    345  8290.0    3.9    10.2     10     73     10     76      3     41         **
** 8/30/81    400  8290.0    4.0    10.0     10     74     10     78      3     42         **
** 8/30/81    415  8290.0    4.0     9.9     10     74     10     78      3     42         **
** 8/30/81    430  8290.0    4.6     9.5     10     74     10     81      3     44         **
** 8/30/81    445  8290.0    4.6     9.5     10     74     10     81      3     44         **
** 8/30/81    500  8290.0    4.4     9.9     10     74     10     80      3     43         **
** 8/30/81    515  8290.0    4.0    10.2     10     74     10     78      3     42         **
** 8/30/81    530  8290.0    3.6    10.4     10     73     10     75      3     40         **
** 8/30/81    545  8290.0    3.5    10.4     10     73     10     75      3     40         **
** 8/30/81    600  8290.0    4.0    10.2     10     74     10     78      3     42         **
** 8/30/81    615  8290.0    4.2     9.9      8     74      8     79      2     43         **
** 8/30/81    630  8290.0    4.4     9.7      9     73      9     79      3     42         **
** 8/30/81    645  8290.0    4.4     9.7      9     73      9     79      3     42         **
** 8/30/81    700  8290.0    4.5     9.8      8     72      8     78      2     42         **
** 8/30/81    715  8290.0    3.8    10.4      8     72      8     75      2     40         **
** 8/30/81    730  8290.0    3.6    10.6      8     72      8     74      2     40         **
** 8/30/81    745  8290.0    4.2     9.5      7     72      7     77      2     41         **
** 8/30/81    800  8290.0    4.4     9.6      7     72      7     78      2     42         **
** 8/30/81    815  8290.0    4.3     9.8      6     72      6     77      2     42         **
** 8/30/81    830  8290.0    4.1    10.0      6     72      6     76      2     41         **
** 8/30/81    845  8290.0    4.0    10.0      6     72      6     76      2     41         **
** 8/30/81    900  8290.0    4.4     9.6      6     72      6     78      2     42         **
** 8/30/81    915  8290.0    4.3     9.5      5     72      5     77      1     42         **
** 8/30/81    930  8290.0    5.2     8.9      5     71      5     80      1     43         **
** 8/30/81    945  8290.0    5.5     8.8      5     72      5     83      1     45         **
** 8/30/81   1000  8290.0    5.4     9.1      5     72      5     83      1     45         **
** 8/30/81   1015  8290.0    5.2     9.2      5     71      5     80      1     43         **
** 8/30/81   1030  8290.0    4.8     9.5      5     72      5     80      1     43         **
** 8/30/81   1045  8290.0    4.4     9.6      5     72      5     78      1     42         **
** 8/30/81   1100  8290.0    4.6     9.5      6     72      6     79      2     42         **
** 8/30/81   1115      .0    5.0     6.5     15     72     16     81      5     43      C  **
** 8/30/81   1130  8290.0    5.1     8.9      6     72      6     81      2     44         **
** 8/30/81   1145  8290.0    5.4     8.8      6     72      6     83      2     45         **
** 8/30/81   1200  8290.0    5.3     8.9      6     72      6     82      2     44         **
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**                              PETROLEUM PROCESS HEATER, LOW NOX BURNERS                               **
**                                             15 MIN. DATA                                             **
**                                     DRY STACK GAS CONCENTRATION                                      **
**                           O2     CO2      CO      NO      CO      NO      CO      NO  ACODE  **
**                  LOAD   VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J         **
**   DATE   TIME     B/D   MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                         **
**********************************************************************************************************
** 8/30/81  1215  8290.0    4.8     9.2       6      72       6      80       2      43         **
** 8/30/81  1230  8290.0    4.4     9.4       6      72       6      78       2      42         **
** 8/30/81  1245  8290.0    4.3     9.4       6      72       6      77       2      42         **
** 8/30/81  1300  8290.0    4.7     9.2       5      72       5      79       1      43         **
** 8/30/81  1315  8290.0    4.8     9.3       5      72       5      80       1      43         **
** 8/30/81  1330  8290.0    4.4     9.4       5      73       5      79       1      42         **
** 8/30/81  1345  8290.0    3.6    10.1       6      71       6      73       2      39         **
** 8/30/81  1400  8290.0    3.7    10.0       6      72       6      74       2      40         **
** 8/30/81  1415  8290.0    4.0     9.7       6      72       6      76       2      41         **
** 8/30/81  1430  8290.0    4.6     9.3       6      72       6      79       2      42         **
** 8/30/81  1445  8290.0    4.7     9.1       7      72       7      79       2      43         **
** 8/30/81  1500  8290.0    4.6     9.1       7      73       7      80       2      43         **
** 8/30/81  1515  8290.0    4.5     9.3       7      73       7      79       2      43         **
** 8/30/81  1530  8290.0    4.3     9.7       7      73       7      78       2      42         **
** 8/30/81  1545  8290.0    4.1     9.7       7      73       7      77       2      42         **
** 8/30/81  1600  8290.0    3.5    10.1       7      73       7      75       2      40         **
** 8/30/81  1615  8290.0    3.5    10.1       7      72       7      74       2      40         **
** 8/30/81  1630  8290.0    4.5     9.3       7      72       7      78       2      42         **
** 8/30/81  1645  8290.0    4.7     9.1       7      73       7      80       2      43         **
** 8/30/81  1700  8290.0    4.6     9.1       7      73       7      80       2      43         **
** 8/30/81  1715  8290.0    4.6     9.1       7      73       7      80       2      43         **
** 8/30/81  1730  8290.0    4.2     9.3       7      73       7      78       2      42         **
** 8/30/81  1745  8290.0    3.5    10.0     100      73     102      75      33      40         **
** 8/30/81  1800  8290.0    1.7    10.8     450      70     419      65     138      35         **
** 8/30/81  1815  8290.0     .8    11.4     500      68     445      60     146      32         **
** 8/30/81  1830  8290.0    1.0    11.2     300      67     269      60      88      32         **
** 8/30/81  1845  8290.0    1.8    10.8      25      67      23      62       7      34         **
** 8/30/81  1900  8290.0    3.3    10.2      15      70      15      71       5      38         **
** 8/30/81  1915      .0     .0      .0       0       0       0       0       0       0      C  **
** 8/30/81  1930  8290.0    4.8     9.3      10      73      11      81       3      44         **
** 8/30/81  1945  8290.0    4.0     9.6       9      72       9      76       3      41         **
** 8/30/81  2000  8290.0    3.7    10.1      10      72      10      74       3      40         **
** 8/30/81  2015  8290.0    3.6    10.2      10      72      10      74       3      40         **
** 8/30/81  2030  8290.0    3.5     9.8      10      72      10      74       3      40         **
** 8/30/81  2045  8290.0    4.0     9.5      10      73      10      77       3      41         **
** 8/30/81  2100  8290.0    3.9     9.7      10      73      10      76       3      41         **
** 8/30/81  2115  8290.0    3.7    10.0      11      73      11      75       3      41         **
** 8/30/81  2130  8290.0    3.6    10.0      11      74      11      76       3      41         **
** 8/30/81  2145  8290.0    3.9     9.7      11      74      11      77       3      42         **
** 8/30/81  2200  8290.0    3.7    10.0      11      74      11      77       3      41         **
** 8/30/81  2215  8290.0    3.6     9.8      11      74      11      76       3      41         **
** 8/30/81  2230  8290.0    3.8     9.8      11      74      11      77       3      42         **
** 8/30/81  2245  8290.0    3.8     9.6      11      74      11      77       3      42         **
** 8/30/81  2300  8290.0    4.3     9.3      11      74      11      79       3      43         **
** 8/30/81  2315  8290.0    4.7     9.2      11      74      12      81       4      44         **
** 8/30/81  2330  8290.0    4.6     9.4      11      75      12      82       3      44         **
** 8/30/81  2345  8290.0    4.2     9.5      11      75      11      80       3      43         **
** 8/30/81  2400  8290.0    3.6    10.0      11      75      11      77       3      42         **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/31/81	15	8290.0	3.7	10.3	20	75	20	78	6	42	
8/31/81	30	8290.0	4.3	10.1	20	75	21	80	7	43	
8/31/81	45	8290.0	4.3	9.4	18	75	19	80	6	43	
8/31/81	100	8290.0	4.2	9.3	17	75	18	80	5	43	
8/31/81	115	8290.0	4.2	9.3	16	76	17	81	5	44	
8/31/81	130	8290.0	4.0	9.5	15	76	15	80	5	43	
8/31/81	145	8290.0	3.8	10.0	15	75	15	78	5	42	
8/31/81	200	8290.0	3.1	10.5	15	75	15	75	4	40	
8/31/81	215	8290.0	3.3	10.3	16	74	16	75	5	40	
8/31/81	230	8290.0	3.5	10.1	17	73	17	75	5	40	
8/31/81	245	8290.0	4.0	9.6	17	74	18	78	5	42	
8/31/81	300	8290.0	4.1	9.8	15	75	15	79	5	43	
8/31/81	315	.0	.0	.0	0	0	0	0	0	0	C
8/31/81	330	8290.0	4.0	9.6	14	75	14	79	4	43	
8/31/81	345	8290.0	4.4	9.5	15	74	16	80	5	43	
8/31/81	400	8290.0	4.0	10.1	15	75	15	79	5	43	
8/31/81	415	8290.0	4.3	10.0	15	75	16	80	5	43	
8/31/81	430	8290.0	4.0	10.1	14	75	14	79	4	43	
8/31/81	445	8290.0	3.9	10.2	15	75	15	78	5	42	
8/31/81	500	8290.0	3.3	10.4	15	75	15	76	5	41	
8/31/81	515	8290.0	3.5	10.3	15	75	15	77	5	41	
8/31/81	530	8290.0	3.7	10.0	15	75	15	78	5	42	
8/31/81	545	8290.0	4.2	9.6	14	75	15	80	4	43	
8/31/81	600	8290.0	4.2	9.5	14	74	15	79	4	43	
8/31/81	615	8290.0	4.0	9.4	15	74	15	78	5	42	
8/31/81	630	8290.0	4.4	9.4	15	75	16	81	5	44	
8/31/81	645	8290.0	4.5	9.3	15	75	16	81	5	44	
8/31/81	700	8290.0	4.5	9.3	14	74	15	80	5	43	
8/31/81	715	8290.0	4.6	9.3	13	74	14	81	4	44	
8/31/81	730	8290.0	4.8	9.2	13	73	14	81	4	44	
8/31/81	745	8290.0	4.5	9.3	13	74	14	80	4	43	
8/31/81	800	8290.0	4.6	9.2	13	74	14	81	4	44	
8/31/81	815	8290.0	4.7	9.2	12	74	13	81	4	44	
8/31/81	830	8290.0	4.4	9.1	11	74	11	80	3	43	
8/31/81	845	8290.0	5.1	8.9	10	74	11	83	3	45	
8/31/81	900	8290.0	4.0	9.5	12	74	12	78	4	42	
8/31/81	915	8290.0	3.8	10.1	13	75	13	78	4	42	
8/31/81	930	8290.0	3.8	10.0	11	76	11	79	3	43	
8/31/81	945	8290.0	4.4	9.3	12	76	13	82	4	44	
8/31/81	1000	8290.0	4.8	9.2	10	77	11	85	3	46	
8/31/81	1015	8290.0	5.0	9.1	10	77	11	86	3	47	
8/31/81	1030	8290.0	5.0	9.1	10	77	11	86	3	47	
8/31/81	1045	8290.0	5.0	9.1	11	77	12	86	4	47	
8/31/81	1100	8290.0	5.1	9.0	11	76	12	86	4	46	
8/31/81	1115	.0	.0	.0	0	0	0	0	0	0	C
8/31/81	1130	8290.0	3.8	10.0	15	77	15	80	5	43	
8/31/81	1145	8290.0	3.9	10.0	16	77	16	81	5	43	
8/31/81	1200	8290.0	3.5	10.2	16	77	16	79	5	42	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
8/31/81	1215	8290.0	3.1	10.2	15	76	15	76	4	41	
8/31/81	1230	8290.0	3.5	10.0	8	78	8	80	2	43	
8/31/81	1245	8290.0	3.9	9.7	15	77	15	81	5	43	
8/31/81	1300	8290.0	3.7	9.8	15	78	15	81	5	44	
8/31/81	1315	.0	.0	.0	0	0	0	0	0	0	C
8/31/81	1330	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1345	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1400	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1415	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1430	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1445	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1500	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1515	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1530	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1545	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1600	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1615	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1630	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1645	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1700	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1715	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1730	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1745	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1800	.0	.0	.0	0	0	0	0	0	0	J
8/31/81	1815	8290.0	2.6	9.8	15	70	14	68	4	37	
8/31/81	1830	8290.0	4.0	9.2	15	70	15	74	5	40	
8/31/81	1845	8290.0	4.8	8.8	13	69	14	76	4	41	
8/31/81	1900	8290.0	4.3	9.1	13	68	14	73	4	39	
8/31/81	1915	8290.0	4.4	9.0	13	67	14	72	4	39	
8/31/81	1930	8290.0	5.3	8.5	12	66	13	75	4	41	
8/31/81	1945	8290.0	4.5	9.0	13	67	14	73	4	39	
8/31/81	2000	8290.0	4.9	8.7	15	66	16	73	5	40	
8/31/81	2015	8290.0	5.7	8.3	15	65	17	76	5	41	
8/31/81	2030	8290.0	5.8	8.2	14	65	16	77	5	41	
8/31/81	2045	8290.0	5.0	8.6	16	66	18	74	5	40	
8/31/81	2100	8290.0	5.6	8.3	16	65	18	76	6	41	
8/31/81	2115	8290.0	6.0	8.1	15	64	18	76	5	41	
8/31/81	2130	8290.0	6.0	8.1	15	64	18	76	5	41	
8/31/81	2145	8290.0	5.9	8.2	16	65	19	77	6	42	
8/31/81	2200	8290.0	5.7	8.1	16	65	18	76	6	41	
8/31/81	2215	8290.0	5.7	8.0	7	64	8	75	2	40	
8/31/81	2230	8290.0	5.6	8.3	13	65	15	76	5	41	
8/31/81	2245	8290.0	5.5	8.3	13	65	15	75	4	40	
8/31/81	2300	8290.0	5.6	8.1	9	64	10	74	3	40	
8/31/81	2315	8290.0	5.6	8.1	8	64	9	74	3	40	
8/31/81	2330	8290.0	5.6	8.2	8	64	9	74	3	40	
8/31/81	2345	8290.0	5.6	8.1	8	64	9	74	3	40	
8/31/81	2400	8290.0	5.6	8.1	9	64	10	74	3	40	

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**                      PETROLEUM PROCESS HEATER, LOW NOX BURNERS                         **
**                                   15 MIN. DATA                                         **
**                            DRY STACK GAS CONCENTRATION                                 **
**                            O2    CO2     CO     NO     CO     NO     CO     NO  ACODE  **
**                   LOAD   VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J         **
**  DATE    TIME      B/D   MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                       **
********************************************************************************************
** 9/ 1/81    15   8290.0    5.5    8.2      8     64      9     74      3     40         **
** 9/ 1/81    30   8290.0    5.4    8.3      9     65     10     75      3     40         **
** 9/ 1/81    45   8290.0    5.6    8.1      8     64      9     74      3     40         **
** 9/ 1/81   100   8290.0    5.8    8.1      8     64      9     75      3     41         **
** 9/ 1/81   115   8290.0    5.5    8.2      8     65      9     75      3     40         **
** 9/ 1/81   130   8290.0    5.6    8.8      8     64      9     74      3     40         **
** 9/ 1/81   145   8290.0    5.4    8.3      8     65      9     75      3     40         **
** 9/ 1/81   200   8290.0    5.7    8.1      8     64      9     75      3     40         **
** 9/ 1/81   215   8290.0    5.9    8.0      8     64      9     76      3     41         **
** 9/ 1/81   230   8220.0    6.2    7.8      8     63      9     76      3     41         **
** 9/ 1/81   245   8220.0    6.2    7.8      8     63      9     76      3     41         **
** 9/ 1/81   300   8220.0    5.6    8.2      9     64     10     74      3     40         **
** 9/ 1/81   315   8220.0    4.8    8.6      9     66     10     73      3     39         **
** 9/ 1/81   330   8220.0    5.4    8.3      9     64     10     73      3     40         **
** 9/ 1/81   345   8220.0    6.4    7.7      8     59      9     72      3     39         **
** 9/ 1/81   400   8220.0    5.8    8.0      8     63      9     74      3     40         **
** 9/ 1/81   415   8220.0    5.6    8.1      7     64      8     74      2     40         **
** 9/ 1/81   430   8220.0    5.7    8.1      8     63      9     74      3     40         **
** 9/ 1/81   445   8220.0    5.8    8.1      7     63      8     74      2     40         **
** 9/ 1/81   500   8220.0    5.5    8.2      7     64      8     74      2     40         **
** 9/ 1/81   515   8220.0    5.5    8.7      8     63      9     73      3     39         **
** 9/ 1/81   530       .0     .0     .0      0      0      0      0      0      0    C    **
** 9/ 1/81   545   8220.0    5.6    8.1      7     63      8     73      2     39         **
** 9/ 1/81   600   8220.0    4.1    9.0      9     64      9     68      3     36         **
** 9/ 1/81   615   8500.0    6.2    7.8      8     59      9     71      3     38         **
** 9/ 1/81   630   8500.0    5.5    8.2      7     61      8     70      2     38         **
** 9/ 1/81   645   8500.0    3.8    9.2      8     65      8     68      2     36         **
** 9/ 1/81   700   8500.0    4.8    8.6      7     65      7     72      2     39         **
** 9/ 1/81   715   8500.0    6.0    7.9      5     63      6     75      1     41         **
** 9/ 1/81   730   8500.0    6.2    7.8      6     61      7     74      2     40         **
** 9/ 1/81   745   8500.0    6.2    7.8      6     61      7     74      2     40         **
** 9/ 1/81   800   8500.0    6.1    7.8      5     62      6     74      1     40         **
** 9/ 1/81   815   8500.0    6.4    7.7      6     61      7     75      2     40         **
** 9/ 1/81   830   8500.0    6.2    7.8      6     61      7     74      2     40         **
** 9/ 1/81   845   8500.0    6.6    7.5      5     60      6     75      2     40         **
** 9/ 1/81   900   8500.0    6.9    7.4      5     59      6     75      2     40         **
** 9/ 1/81   915   8500.0    7.3    7.1      5     57      6     75      2     40         **
** 9/ 1/81   930   8500.0    7.1    7.2      5     58      6     75      2     40         **
** 9/ 1/81   945   8500.0    7.1    7.2      5     58      6     75      2     40         **
** 9/ 1/81  1000   8500.0    7.0    7.4      5     59      6     75      2     41         **
** 9/ 1/81  1015   8500.0    6.7    7.5      5     60      6     75      2     41         **
** 9/ 1/81  1030   8500.0    6.6    7.6      5     60      6     75      2     40         **
** 9/ 1/81  1045   8500.0    6.8    7.4      5     60      6     76      2     41         **
** 9/ 1/81  1100   8500.0    6.7    7.4      5     59      6     74      2     40         **
** 9/ 1/81  1115   8500.0    6.8    7.4      5     60      6     76      2     41         **
** 9/ 1/81  1130   8500.0    6.9    7.4      3     59      3     75      1     40         **
** 9/ 1/81  1145       .0     .0     .0      0      0      0      0      0      0    J    **
** 9/ 1/81  1200       .0     .0     .0      0      0      0      0      0      0    J    **
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**                         PETROLEUM PROCESS HEATER, LOW NOX BURNERS                            **
**                                       15 MIN. DATA                                           **
**                               DRY STACK GAS CONCENTRATION                                    **
**                                 O2      CO2     CO      NO      CO      NO      CO     NO   ACODE **
**                       LOAD     VOL%    VOL%    PPMV    PPMV    PPMV    PPMV   NG/J   NG/J        **
**    DATE     TIME      B/D      MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                      **
**************************************************************************************************
** 9/ 1/81   1215        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1230        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1245        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1300        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1315        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1330        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1345        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1400        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1415        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1430        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1445        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1500        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1515        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1530        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1545        .0       .0      .0       0       0       0       0      0      0    J    **
** 9/ 1/81   1600    8500.0      2.9    10.3      10      81       9      80      3     43         **
** 9/ 1/81   1615    8500.0      3.5    10.1      10      81      10      83      3     45         **
** 9/ 1/81   1630    8500.0      4.1     9.8      10      80      10      85      3     46         **
** 9/ 1/81   1645    8500.0      4.2     9.7       9      80       9      85      3     46         **
** 9/ 1/81   1700    8500.0      4.4     9.5       9      80       9      86      3     47         **
** 9/ 1/81   1715    8500.0      4.4     9.6       9      80       9      86      3     47         **
** 9/ 1/81   1730    8500.0      4.1     9.7       9      78       9      83      3     45         **
** 9/ 1/81   1745    8500.0      4.1     9.8       8      80       8      85      2     46         **
** 9/ 1/81   1800    8500.0      3.9     9.9       8      79       8      83      2     45         **
** 9/ 1/81   1815    8500.0      3.1    10.4       8      77       8      77      2     42         **
** 9/ 1/81   1830    8500.0      3.2    10.3       8      76       8      76      2     41         **
** 9/ 1/81   1845    8500.0      4.2     9.7       7      78       7      83      2     45         **
** 9/ 1/81   1900    8500.0      4.4     9.6       7      77       7      83      2     45         **
** 9/ 1/81   1915    8500.0      4.7     9.3       7      76       7      83      2     45         **
** 9/ 1/81   1930    8500.0      5.0     9.2       7      76       7      85      2     46         **
** 9/ 1/81   1945    8500.0      4.6     9.4       8      77       8      84      2     45         **
** 9/ 1/81   2000    8500.0      4.5     9.5       9      77       9      84      3     45         **
** 9/ 1/81   2015    8500.0      4.8     9.4       9      77      10      85      3     46         **
** 9/ 1/81   2030    8500.0      5.0     9.2      10      76      11      85      3     46         **
** 9/ 1/81   2045    8500.0      4.8     9.3      10      77      11      85      3     46         **
** 9/ 1/81   2100    8500.0      4.4     9.6      10      77      10      83      3     45         **
** 9/ 1/81   2115    8500.0      4.0     9.8      11      78      11      82      3     44         **
** 9/ 1/81   2130    8500.0      4.4     9.5      11      77      11      83      3     45         **
** 9/ 1/81   2145    8500.0      3.9     9.9      11      79      11      83      3     45         **
** 9/ 1/81   2200    8500.0      4.1     9.7      10      78      10      83      3     45         **
** 9/ 1/81   2215    8500.0      4.4     9.6      11      79      11      85      3     46         **
** 9/ 1/81   2230    8500.0      4.2     9.7      11      78      11      83      3     45         **
** 9/ 1/81   2245    8500.0      3.4    10.2      12      79      12      80      4     43         **
** 9/ 1/81   2300    8500.0      3.6    10.1      12      79      12      81      4     44         **
** 9/ 1/81   2315    8500.0      4.0     9.8      11      80      11      84      3     45         **
** 9/ 1/81   2330    8500.0      3.9     9.0       0      79       0      83      0     45         **
** 9/ 1/81   2345    8500.0      4.1     9.0       4      91       4      96      1     52         **
** 9/ 1/81   2400    8500.0      4.2     9.9       4      96       4     102      1     55         **
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**                    PETROLEUM PROCESS HEATER, LOW NOX BURNERS                       **
**                                  15 MIN. DATA                                      **
**                          DRY STACK GAS CONCENTRATION                               **
**                             O2     CO2     CO     NO      CO     NO     CO     NO  ACODE **
**                    LOAD    VOL%   VOL%   PPMV   PPMV    PPMV   PPMV   NG/J   NG/J       **
**    DATE    TIME     B/D    MEAS   MEAS   MEAS   MEAS    3%O2   3%O2                      **
****************************************************************************************
** 9/ 2/81      15  8500.0    4.1    10.0      5     96      5    102      1     55       **
** 9/ 2/81      30  8500.0    3.6    10.3      5     94      5     97      1     52       **
** 9/ 2/81      45  8500.0    2.9    10.6      5     97      4     96      1     52       **
** 9/ 2/81     100  8500.0    3.3    10.5      4     96      4     97      1     52       **
** 9/ 2/81     115  8500.0    3.3    10.5      5     96      5     97      1     52       **
** 9/ 2/81     130  8500.0    4.1    10.1      4     95      4    101      1     54       **
** 9/ 2/81     145  8500.0    4.6     9.7      4     96      4    105      1     57       **
** 9/ 2/81     200  8500.0    4.3     9.9      4     96      4    103      1     56       **
** 9/ 2/81     215  8500.0    4.0    10.2      4     96      4    101      1     55       **
** 9/ 2/81     230  8500.0    3.8    10.2      4     96      4    100      1     54       **
** 9/ 2/81     245  8500.0    3.8    10.2      4     97      4    101      1     55       **
** 9/ 2/81     300  8500.0    4.1    10.0      4     96      4    102      1     55       **
** 9/ 2/81     315  8500.0    3.9    10.2      4     96      4    101      1     54       **
** 9/ 2/81     330  8500.0    4.2     9.9      3     95      3    101      1     55       **
** 9/ 2/81     345  8500.0    3.8    10.2      3     97      3    101      1     55       **
** 9/ 2/81     400  8500.0    3.6    10.3      4     96      4     99      1     53       **
** 9/ 2/81     415  8500.0    3.8    10.2      4     95      4     99      1     53       **
** 9/ 2/81     430  8500.0    4.3     9.9      3     95      3    102      1     55       **
** 9/ 2/81     445  8500.0    4.3     9.9      3     96      3    103      1     56       **
** 9/ 2/81     500  8500.0    4.3     9.9      3     95      3    102      1     55       **
** 9/ 2/81     515  8500.0    4.8     9.8      3     95      3    103      1     55       **
** 9/ 2/81     530  8500.0    4.7     9.6      3     94      3    103      1     56       **
** 9/ 2/81     545  8500.0    4.4     9.8      3     96      3    104      1     56       **
** 9/ 2/81     600  8500.0    4.3     9.9      3     96      3    103      1     56       **
** 9/ 2/81     615  8500.0    4.3     9.9      3     96      3    103      1     56       **
** 9/ 2/81     630  8500.0    4.8     9.5      3     94      3    104      1     56       **
** 9/ 2/81     645  8500.0    4.8     9.5      3     95      3    105      1     57       **
** 9/ 2/81     700  8500.0    4.8     9.6      3     95      3    105      1     57       **
** 9/ 2/81     715  8500.0    4.9     9.5      2     96      2    107      0     58       **
** 9/ 2/81     730      .0     .0      .0      0      0      0      0      0      0  C    **
** 9/ 2/81     745  8500.0    4.9     9.2      8     78      8     87      2     47       **
** 9/ 2/81     800  8500.0    4.9     9.2      8     78      8     87      2     47       **
** 9/ 2/81     815  8500.0    5.0     9.2      8     78      9     87      2     47       **
** 9/ 2/81     830  8500.0    4.9     9.2      8     78      8     87      2     47       **
** 9/ 2/81     845  8500.0    5.1     9.1      7     78      7     88      2     47       **
** 9/ 2/81     900  8500.0    5.3     9.0      7     78      8     89      2     48       **
** 9/ 2/81     915  8500.0    5.8     8.7      7     77      8     91      2     49       **
** 9/ 2/81     930  8500.0    5.7     8.7      7     76      8     89      2     48       **
** 9/ 2/81     945  8500.0    6.1     8.5      6     76      7     91      2     49       **
** 9/ 2/81    1000  8500.0    6.0     8.7      6     77      7     92      2     50       **
** 9/ 2/81    1015  8500.0    5.9     8.8      7     78      8     93      2     50       **
** 9/ 2/81    1030      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1045      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1100      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1115      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1130      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1145      .0     .0      .0      0      0      0      0      0      0  J    **
** 9/ 2/81    1200      .0     .0      .0      0      0      0      0      0      0  J    **
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**                                 PETROLEUM PROCESS HEATER, LOW NOX BURNERS              **
**                                                   15 MIN. DATA                         **
**                                        DRY STACK  GAS CONCENTRATION                    **
**                                  O2      CO2      CO     NO     CO     NO    CO    NO   ACODE **
**                         LOAD    VOL%    VOL%     PPMV   PPMV   PPMV   PPMV  NG/J  NG/J       **
**    DATE      TIME       B/D     MEAS    MEAS     MEAS   MEAS   3%O2   3%O2             **
*****************************************************************************************
** 9/ 2/81      1215         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1230         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1245         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1300         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1315         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1330         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1345         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1400         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1415         .0      .0      .0        0      0      0      0     0     0   J   **
** 9/ 2/81      1430     8500.0     5.4     9.1        8     86      9     99     3    53       **
** 9/ 2/81      1445     8500.0     5.9     9.1        8     82      9     97     3    53       **
** 9/ 2/81      1500     8500.0     5.4     9.4        8     83      9     95     3    51       **
** 9/ 2/81      1515     8500.0     5.4     9.1        8     81      9     93     3    50       **
** 9/ 2/81      1530         .0      .0      .0        0      0      0      0     0     0   C   **
** 9/ 2/81      1545     8500.0     5.1     9.2        7     78      7     88     2    47       **
** 9/ 2/81      1600     8500.0     4.8     9.4        8     78      8     86     2    47       **
** 9/ 2/81      1615     8500.0     5.2     9.1        8     77      9     87     3    47       **
** 9/ 2/81      1630     8500.0     5.4     9.0        7     77      8     88     2    48       **
** 9/ 2/81      1645     8500.0     5.3     9.1        8     77      9     88     3    47       **
** 9/ 2/81      1700     8500.0     5.3     9.1        8     77      9     88     3    47       **
** 9/ 2/81      1715     8500.0     5.4     9.1        8     77      9     88     3    48       **
** 9/ 2/81      1730     8500.0     4.7     9.5        8     78      8     86     2    46       **
** 9/ 2/81      1745     8500.0     4.2     9.7        8     78      8     83     2    45       **
** 9/ 2/81      1800     8500.0     4.7     9.4        8     77      8     85     2    46       **
** 9/ 2/81      1815     8500.0     5.1     9.3        8     77      9     87     2    47       **
** 9/ 2/81      1830     8500.0     3.8    10.1        9     77      9     80     3    43       **
** 9/ 2/81      1845     8500.0     3.3    10.4       10     77     10     78     3    42       **
** 9/ 2/81      1900     8500.0     3.3    10.3       10     78     10     79     3    43       **
** 9/ 2/81      1915     8500.0     4.9     9.2        9     76     10     85     3    46       **
** 9/ 2/81      1930     8500.0     4.8     9.4        9     77     10     85     3    46       **
** 9/ 2/81      1945     8500.0     4.3     9.7       10     77     10     83     3    45       **
** 9/ 2/81      2000     8500.0     3.9     9.9       11     77     11     81     3    43       **
** 9/ 2/81      2015     8500.0     4.6     9.5       11     77     12     84     3    45       **
** 9/ 2/81      2030     8500.0     4.4     9.6       11     77     11     83     3    45       **
** 9/ 2/81      2045     8500.0     4.5     9.6       12     77     13     84     4    45       **
** 9/ 2/81      2100     8500.0     5.2     9.1       11     77     12     87     4    47       **
** 9/ 2/81      2115     8500.0     5.4     9.0       11     76     12     87     4    47       **
** 9/ 2/81      2130     8500.0     5.2     9.2       12     77     13     87     4    47       **
** 9/ 2/81      2145     8500.0     5.4     9.1       11     77     12     88     4    48       **
** 9/ 2/81      2200     8500.0     5.4     9.1       11     77     12     88     4    48       **
** 9/ 2/81      2215     8500.0     4.7     8.9        8     79      8     87     2    47       **
** 9/ 2/81      2230         .0      .0      .0        0      0      0      0     0     0   C   **
** 9/ 2/81      2245         .0     4.5      .0      585     78    638     85   210    46   F   **
** 9/ 2/81      2300         .0     4.8      .0      505     78    561     86   184    47   F   **
** 9/ 2/81      2315         .0     4.9      .0      504     77    563     86   185    46   F   **
** 9/ 2/81      2330         .0     4.8      .0      505     78    561     86   184    47   F   **
** 9/ 2/81      2345         .0     4.8      .0      505     78    561     86   184    47   F   **
** 9/ 2/81      2400         .0     4.5      .0      505     78    551     85   181    46   F   **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/ 3/81	15	8500.0	4.7	11.5	5	77	5	85	1	46	
9/ 3/81	30	8500.0	4.7	11.6	5	77	5	85	1	46	
9/ 3/81	45	8500.0	5.0	11.4	5	78	5	87	1	47	
9/ 3/81	100	8500.0	5.1	11.3	5	77	5	87	1	47	
9/ 3/81	115	8500.0	4.5	11.9	5	76	5	82	1	44	
9/ 3/81	130	8500.0	4.1	12.1	5	78	5	83	1	45	
9/ 3/81	145	8500.0	4.5	11.8	5	78	5	85	1	46	
9/ 3/81	200	8500.0	4.7	11.6	5	77	5	85	1	46	
9/ 3/81	215	8500.0	4.8	11.6	5	77	5	85	1	46	
9/ 3/81	230	8500.0	4.2	12.1	5	78	5	83	1	45	
9/ 3/81	245	8500.0	4.2	12.0	5	78	5	83	1	45	
9/ 3/81	300	8500.0	4.0	12.2	5	78	5	82	1	44	
9/ 3/81	315	8500.0	4.8	11.5	4	77	4	85	1	46	
9/ 3/81	330	8500.0	4.8	11.6	5	77	5	85	1	46	
9/ 3/81	345	8500.0	4.5	11.8	5	78	5	85	1	46	
9/ 3/81	400	8455.0	4.3	11.9	5	77	5	83	1	45	
9/ 3/81	415	8455.0	4.9	11.5	5	77	5	86	1	46	
9/ 3/81	430	8455.0	5.0	11.5	4	77	4	86	1	47	
9/ 3/81	445	8455.0	4.7	11.7	4	77	4	85	1	46	
9/ 3/81	500	8455.0	4.6	11.7	5	78	5	85	1	46	
9/ 3/81	515	8455.0	4.6	11.8	4	77	4	84	1	45	
9/ 3/81	530	8455.0	4.3	12.0	4	77	4	83	1	45	
9/ 3/81	545	8455.0	4.6	11.7	4	77	4	84	1	45	
9/ 3/81	600	.0	.0	.0	0	0	0	0	0	0	C
9/ 3/81	615	7140.0	4.6	9.0	6	79	6	86	2	47	
9/ 3/81	630	7140.0	5.5	11.0	7	77	8	89	2	48	
9/ 3/81	645	7140.0	5.7	10.8	7	76	8	89	2	48	
9/ 3/81	700	7140.0	6.0	10.5	6	75	7	90	2	48	
9/ 3/81	715	7140.0	3.9	10.4	8	77	8	81	2	43	
9/ 3/81	730	7140.0	4.6	11.6	7	77	7	84	2	45	
9/ 3/81	745	7140.0	6.2	10.3	6	76	7	92	2	50	
9/ 3/81	800	7140.0	6.8	9.8	6	73	7	92	2	50	
9/ 3/81	815	7140.0	6.9	9.8	5	73	6	93	2	50	
9/ 3/81	830	7140.0	6.5	10.3	6	75	7	93	2	50	
9/ 3/81	845	7140.0	6.4	10.4	5	75	6	92	2	50	
9/ 3/81	900	7140.0	6.4	10.3	5	75	6	92	2	50	
9/ 3/81	915	7140.0	6.4	10.3	5	75	6	92	2	50	
9/ 3/81	930	7140.0	6.4	10.3	5	75	6	92	2	50	
9/ 3/81	945	7140.0	6.4	10.3	4	75	4	92	1	50	
9/ 3/81	1000	7140.0	6.1	10.6	5	76	6	91	1	49	
9/ 3/81	1015	7140.0	6.4	10.3	5	75	6	92	2	50	
9/ 3/81	1030	7140.0	6.6	10.1	4	74	5	92	1	50	
9/ 3/81	1045	7140.0	6.6	10.2	5	75	6	93	2	50	
9/ 3/81	1100	7140.0	7.3	9.3	4	72	5	94	1	51	
9/ 3/81	1115	.0	.0	.0	0	0	0	0	0	0	J
9/ 3/81	1130	.0	.0	.0	0	0	0	0	0	0	J
9/ 3/81	1145	.0	.0	.0	0	0	0	0	0	0	J
9/ 3/81	1200	.0	.0	.0	0	0	0	0	0	0	J

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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                   **
**                                        15 MIN. DATA                                  **
**                               DRY STACK GAS CONCENTRATION                            **
**                                 O2     CO2     CO     NO     CO     NO     CO     NO  ACODE **
**                        LOAD   VOL%    VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J       **
**    DATE      TIME       B/D   MEAS    MEAS   MEAS   MEAS   3%O2   3%O2                     **
******************************************************************************************
** 9/ 3/81   1215          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1230          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1245          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1300          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1315          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1330          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1345          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1400          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1415          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1430          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1445          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1500          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1515          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1530          .0     .0      .0      0      0      0      0      0      0  J     **
** 9/ 3/81   1545      7140.0     .0     9.1      7     81      5     69      1     37  E     **
** 9/ 3/81   1600      7140.0     .0     9.2      8     81      6     69      2     37  E     **
** 9/ 3/81   1615      7140.0     .0     9.2      8     81      6     69      2     37  E     **
** 9/ 3/81   1630      7140.0     .0     9.4      8     81      6     69      2     37  E     **
** 9/ 3/81   1645      7140.0     .0    10.1      8     81      6     69      2     37  E     **
** 9/ 3/81   1700      7140.0     .0    10.2      9     80      7     68      2     37  E     **
** 9/ 3/81   1715      7140.0     .0    10.0      8     81      6     69      2     37  E     **
** 9/ 3/81   1730      7140.0     .0     9.8      8     82      6     70      2     38  E     **
** 9/ 3/81   1745      7140.0     .0     9.6      9     81      7     69      2     37  E     **
** 9/ 3/81   1800      7140.0     .0     9.8      9     81      7     69      2     37  E     **
** 9/ 3/81   1815      7140.0     .0    10.0      9     82      7     70      2     38  E     **
** 9/ 3/81   1830      7140.0     .0     9.5      9     82      7     70      2     38  E     **
** 9/ 3/81   1845      7140.0     .0     9.2      9     81      7     69      2     37  E     **
** 9/ 3/81   1900      7140.0     .0     9.7      9     81      7     69      2     37  E     **
** 9/ 3/81   1915      7140.0     .0    10.3     10     81      8     69      2     37  E     **
** 9/ 3/81   1930      7140.0     .0     9.5      9     81      7     69      2     37  E     **
** 9/ 3/81   1945      7140.0     .0     9.2      9     82      7     70      2     38  E     **
** 9/ 3/81   2000      7140.0     .0     9.1     10     81      8     69      2     37  E     **
** 9/ 3/81   2015      7140.0     .0     9.3     10     82      8     70      2     38  E     **
** 9/ 3/81   2030      7140.0     .0     9.2     10     82      8     70      2     38  E     **
** 9/ 3/81   2045      7140.0     .0     9.4     10     82      8     70      2     38  E     **
** 9/ 3/81   2100      7140.0     .0     9.4     11     82      9     70      3     38  E     **
** 9/ 3/81   2115      7140.0     .0     9.5     11     83      9     71      3     38  E     **
** 9/ 3/81   2130      7140.0     .0     9.5     11     82      9     70      3     38  E     **
** 9/ 3/81   2145      7140.0     .0     9.7     11     82      9     70      3     38  E     **
** 9/ 3/81   2200          .0     .0      .0      0      0      0      0      0      0  C     **
** 9/ 3/81   2215      7140.0     .0     9.4      8     80      6     68      2     37  E     **
** 9/ 3/81   2230      7140.0     .0     9.3      8     80      6     68      2     37  E     **
** 9/ 3/81   2245      7140.0     .0     9.7      9     80      7     68      2     37  E     **
** 9/ 3/81   2300      7140.0     .0     9.8      9     80      7     68      2     37  E     **
** 9/ 3/81   2315      7140.0     .0     9.6      8     80      6     68      2     37  E     **
** 9/ 3/81   2330      7140.0     .0     9.4      8     80      6     68      2     37  E     **
** 9/ 3/81   2345      7140.0     .0     9.5      9     80      7     68      2     37  E     **
** 9/ 3/81   2400      7140.0     .0     9.4      8     79      6     67      2     36  E     **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

			O2	CO2	CO	NO	CO	NO	CO	NO	ACODE
		LOAD	VOL%	VOL%	PPMV	PPMV	PPMV	PPMV	NG/J	NG/J	
DATE	TIME	B/D	MEAS	MEAS	MEAS	MEAS	3%O2	3%O2			
9/10/81	15	6710.0	5.0	9.6	19	69	21	77	7	42	
9/10/81	30	6710.0	5.6	9.2	19	67	22	78	7	42	
9/10/81	45	6710.0	5.2	9.4	19	68	21	77	7	42	
9/10/81	100	7000.0	5.7	9.1	18	66	21	77	6	42	
9/10/81	115	7000.0	5.6	9.1	19	66	22	77	7	41	
9/10/81	130	7000.0	5.8	9.0	18	65	21	77	7	41	
9/10/81	145	7000.0	5.6	9.1	19	66	22	77	7	41	
9/10/81	200	7000.0	5.2	9.4	19	67	21	76	7	41	
9/10/81	215	7000.0	5.4	9.3	19	66	21	76	7	41	
9/10/81	230	7000.0	5.2	9.4	19	67	21	76	7	41	
9/10/81	245	7000.0	5.3	9.4	19	67	21	76	7	41	
9/10/81	300	7000.0	5.8	9.0	19	64	22	75	7	41	
9/10/81	315	7000.0	6.2	8.8	19	63	23	76	7	41	
9/10/81	330	7000.0	5.9	8.9	19	64	22	76	7	41	
9/10/81	345	7000.0	5.7	9.1	19	65	22	76	7	41	
9/10/81	400	7000.0	5.5	9.2	19	66	22	76	7	41	
9/10/81	415	7000.0	5.2	9.5	19	67	21	76	7	41	
9/10/81	430	7000.0	5.3	9.3	19	67	21	76	7	41	
9/10/81	445	.0	.0	.0	0	0	0	0	0	0	C
9/10/81	500	7000.0	6.0	8.8	17	66	20	79	6	43	
9/10/81	515	7000.0	5.7	9.0	17	67	20	78	6	42	
9/10/81	530	7000.0	5.5	9.2	17	68	19	79	6	42	
9/10/81	545	7000.0	5.5	9.1	18	68	20	79	6	42	
9/10/81	600	7000.0	5.2	9.4	17	70	19	79	6	43	
9/10/81	615	7000.0	6.1	8.8	17	68	20	82	6	44	
9/10/81	630	7000.0	6.7	8.5	17	66	21	83	7	45	
9/10/81	645	7000.0	6.9	8.4	16	65	20	83	6	45	
9/10/81	700	7000.0	5.7	9.1	17	68	20	80	6	43	
9/10/81	715	7000.0	5.2	9.4	17	68	19	77	6	42	
9/10/81	730	7000.0	5.7	9.0	16	67	18	78	6	42	
9/10/81	745	7000.0	6.0	8.9	16	67	19	80	6	43	
9/10/81	800	7000.0	5.5	9.2	17	68	19	79	6	42	
9/10/81	815	7000.0	5.3	9.3	17	69	19	79	6	42	
9/10/81	830	7000.0	5.6	9.1	16	68	18	79	6	43	
9/10/81	845	7000.0	5.5	9.2	16	68	18	79	6	42	
9/10/81	900	7000.0	5.4	9.2	16	69	18	79	6	43	
9/10/81	915	7000.0	5.8	9.0	15	68	17	80	5	43	
9/10/81	930	7000.0	5.7	9.1	15	69	17	81	5	44	
9/10/81	945	7000.0	5.8	9.0	15	69	17	81	5	44	
9/10/81	1000	7000.0	5.4	9.3	15	70	17	80	5	43	
9/10/81	1015	7000.0	5.5	9.2	15	70	17	81	5	44	
9/10/81	1030	7000.0	5.6	9.1	14	69	16	80	5	43	
9/10/81	1045	7000.0	5.8	9.0	15	69	17	81	5	44	
9/10/81	1100	7000.0	6.0	8.9	15	69	18	82	5	44	
9/10/81	1115	7000.0	5.8	9.0	14	69	16	81	5	44	
9/10/81	1130	7000.0	5.6	9.1	15	70	17	81	5	44	
9/10/81	1145	7000.0	5.6	9.2	15	70	17	81	5	44	
9/10/81	1200	7000.0	5.6	9.1	14	70	16	81	5	44	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/10/81	1215	7000.0	5.4	9.2	15	71	17	81	5	44	
9/10/81	1230	7000.0	6.0	8.9	14	69	16	82	5	44	
9/10/81	1245	.0	.0	.0	0	0	0	0	0	0	C
9/10/81	1300	7000.0	5.5	9.2	18	74	20	86	6	46	
9/10/81	1315	7000.0	5.5	9.2	18	72	20	83	6	45	
9/10/81	1330	.0	.0	.0	0	0	0	0	0	0	C
9/10/81	1345	7000.0	5.6	9.1	18	78	21	91	6	49	
9/10/81	1400	7000.0	5.4	9.3	18	77	20	88	6	48	
9/10/81	1415	7000.0	5.6	9.1	17	77	19	90	6	48	
9/10/81	1430	7000.0	5.5	9.2	18	78	20	90	6	49	
9/10/81	1445	7000.0	5.6	9.1	17	77	19	90	6	48	
9/10/81	1500	7000.0	5.5	9.2	17	77	19	89	6	48	
9/10/81	1515	7000.0	5.8	9.0	17	75	20	88	6	48	
9/10/81	1530	7000.0	5.8	9.0	17	76	20	90	6	48	
9/10/81	1545	7000.0	5.8	9.0	17	76	20	90	6	48	
9/10/81	1600	7000.0	6.2	8.7	17	74	20	90	6	48	
9/10/81	1615	7000.0	5.9	9.0	16	76	19	90	6	49	
9/10/81	1630	7000.0	5.6	9.1	17	76	19	88	6	48	
9/10/81	1645	7000.0	5.3	9.3	17	77	19	88	6	47	
9/10/81	1700	7000.0	5.4	9.2	21	74	24	85	7	46	
9/10/81	1715	7000.0	5.3	9.3	22	73	25	83	8	45	
9/10/81	1730	7000.0	5.3	9.3	17	75	19	86	6	46	
9/10/81	1745	7000.0	4.8	9.6	17	76	18	84	6	45	
9/10/81	1800	7000.0	5.1	9.4	19	75	21	84	7	46	
9/10/81	1815	7000.0	4.9	9.5	18	77	20	86	6	46	
9/10/81	1830	7000.0	4.7	9.7	18	77	19	85	6	46	
9/10/81	1845	7000.0	4.8	9.6	19	77	21	85	6	46	
9/10/81	1900	7000.0	5.6	9.1	19	73	22	85	7	46	
9/10/81	1915	7000.0	5.6	9.1	18	74	21	86	6	46	
9/10/81	1930	7000.0	5.5	9.1	19	74	22	86	7	46	
9/10/81	1945	7000.0	5.4	9.1	19	75	21	86	7	46	
9/10/81	2000	7000.0	5.3	9.2	19	75	21	86	7	46	
9/10/81	2015	7000.0	5.4	9.2	20	74	23	85	7	46	
9/10/81	2030	7000.0	5.6	9.0	20	73	23	85	7	46	
9/10/81	2045	.0	.0	.0	0	0	0	0	0	0	C
9/10/81	2100	7000.0	6.3	8.6	17	67	20	82	6	44	
9/10/81	2115	7000.0	6.5	8.4	28	57	34	70	11	38	
9/10/81	2130	7000.0	6.8	8.2	31	55	39	69	12	37	
9/10/81	2145	7000.0	6.6	8.4	17	64	21	80	7	43	
9/10/81	2200	7000.0	6.3	8.6	26	59	31	72	10	39	
9/10/81	2215	7000.0	7.3	7.9	3	45	3	59	1	32	
9/10/81	2230	7000.0	6.9	8.2	7	45	8	57	2	31	
9/10/81	2245	7000.0	7.1	8.0	70	52	90	67	29	36	
9/10/81	2300	7000.0	7.5	7.8	21	58	28	77	9	42	
9/10/81	2315	7000.0	7.4	7.9	21	58	27	76	9	41	
9/10/81	2330	7000.0	7.5	7.9	20	58	26	77	8	42	
9/10/81	2345	7000.0	7.3	7.9	17	63	22	82	7	44	
9/10/81	2400	7000.0	7.3	8.0	18	61	23	80	7	43	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/11/81	15	7000.0	7.0	8.1	19	61	24	78	8	42	
9/11/81	30	7000.0	7.0	8.1	30	54	38	69	12	37	
9/11/81	45	7000.0	7.1	8.1	75	48	97	62	32	33	
9/11/81	100	7000.0	6.6	8.4	63	52	78	65	25	35	
9/11/81	115	7000.0	7.0	8.2	34	55	43	70	14	38	
9/11/81	130	7000.0	7.3	8.0	17	63	22	82	7	44	
9/11/81	145	7000.0	7.1	8.1	17	67	22	86	7	47	
9/11/81	200	7000.0	6.7	8.4	17	68	21	85	7	46	
9/11/81	215	7000.0	6.5	8.6	17	71	21	88	6	47	
9/11/81	230	7000.0	6.8	8.3	17	69	21	87	7	47	
9/11/81	245	7000.0	7.1	8.1	16	67	20	86	6	47	
9/11/81	300	7000.0	6.8	8.3	36	55	45	69	15	37	
9/11/81	315	7000.0	7.4	7.9	25	58	33	76	10	41	
9/11/81	330	7000.0	7.3	7.9	15	64	19	84	6	45	
9/11/81	345	7000.0	7.4	7.9	17	61	22	80	7	43	
9/11/81	400	7000.0	7.4	7.9	18	58	23	76	7	41	
9/11/81	415	7000.0	7.2	8.0	17	60	22	78	7	42	
9/11/81	430	7000.0	6.6	7.4	22	58	27	72	9	39	
9/11/81	445	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	500	7000.0	7.6	7.8	16	62	21	83	7	45	
9/11/81	515	7000.0	7.2	8.1	16	66	20	86	6	46	
9/11/81	530	7000.0	7.8	7.7	16	63	21	86	7	46	
9/11/81	545	7000.0	7.5	7.9	15	66	20	88	6	47	
9/11/81	600	7000.0	7.0	8.3	16	69	20	88	6	48	
9/11/81	615	7000.0	7.2	8.2	16	69	20	90	6	48	
9/11/81	630	7000.0	7.0	8.3	15	70	19	90	6	48	
9/11/81	645	7000.0	7.1	8.2	16	68	20	88	6	47	
9/11/81	700	7000.0	6.8	8.5	15	70	19	88	6	48	
9/11/81	715	7000.0	7.3	8.2	15	69	19	90	6	49	
9/11/81	730	7000.0	8.6	7.3	15	60	21	87	7	47	
9/11/81	745	7000.0	8.0	7.7	15	64	20	88	6	48	
9/11/81	800	7000.0	7.8	7.8	15	65	20	88	6	48	
9/11/81	815	7000.0	8.0	7.6	15	65	20	90	6	48	
9/11/81	830	7000.0	7.7	7.8	15	66	20	89	6	48	
9/11/81	845	7000.0	7.9	7.7	15	65	20	89	6	48	
9/11/81	900	7000.0	7.9	7.7	15	66	20	90	6	49	
9/11/81	915	7000.0	7.7	7.9	15	65	20	88	6	47	
9/11/81	930	7000.0	7.7	7.9	15	68	20	92	6	50	
9/11/81	945	7000.0	7.6	8.0	15	67	20	90	6	48	
9/11/81	1000	7000.0	7.8	7.8	14	67	19	91	6	49	
9/11/81	1015	7000.0	7.8	7.8	15	67	20	91	6	49	
9/11/81	1030	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1045	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1100	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1115	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1130	7000.0	7.8	7.8	14	67	19	91	6	49	
9/11/81	1145	7000.0	7.7	7.9	14	67	18	90	6	49	
9/11/81	1200	7000.0	7.8	7.8	13	66	17	90	5	48	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/11/81	1215	7000.0	7.4	8.0	14	67	18	88	6	48	
9/11/81	1230	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1245	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	1300	7000.0	7.5	7.9	17	68	22	90	7	49	
9/11/81	1315	7000.0	7.5	8.0	16	68	21	90	7	49	
9/11/81	1330	7000.0	7.5	8.0	17	67	22	89	7	48	
9/11/81	1345	7000.0	7.3	8.1	16	69	21	90	6	49	
9/11/81	1400	7000.0	7.0	8.3	16	70	20	90	6	48	
9/11/81	1415	7000.0	7.3	8.1	16	70	21	92	6	49	
9/11/81	1430	7000.0	7.0	8.3	16	71	20	91	6	49	
9/11/81	1445	7000.0	6.9	8.4	15	72	19	92	6	49	
9/11/81	1500	7000.0	7.1	8.2	16	71	20	92	6	49	
9/11/81	1515	7000.0	7.2	8.1	16	69	20	90	6	48	
9/11/81	1530	7000.0	7.1	8.2	16	69	20	89	6	48	
9/11/81	1545	7000.0	7.3	8.0	16	68	21	89	6	48	
9/11/81	1600	7000.0	7.6	7.8	18	63	24	84	7	45	
9/11/81	1615	7000.0	8.3	7.4	20	57	28	80	9	43	
9/11/81	1630	7000.0	7.6	7.8	16	63	21	84	7	45	
9/11/81	1645	7000.0	7.9	7.6	17	60	23	82	7	44	
9/11/81	1700	7000.0	7.9	7.6	21	57	28	78	9	42	
9/11/81	1715	7000.0	7.9	7.6	17	59	23	81	7	44	
9/11/81	1730	7000.0	7.6	7.8	23	58	30	78	10	42	
9/11/81	1745	7000.0	7.5	7.9	19	59	25	78	8	42	
9/11/81	1800	7000.0	8.0	7.5	26	56	36	77	11	42	
9/11/81	1815	7000.0	7.3	8.0	17	64	22	84	7	45	
9/11/81	1830	7000.0	7.9	7.7	18	60	24	82	8	44	
9/11/81	1845	7000.0	7.5	7.8	16	60	21	80	7	43	
9/11/81	1900	7000.0	7.5	7.9	23	58	30	77	10	42	
9/11/81	1915	7000.0	7.9	7.7	22	56	30	77	9	41	
9/11/81	1930	7000.0	8.0	7.5	50	51	69	70	22	38	
9/11/81	1945	7000.0	7.5	7.8	20	59	26	78	8	42	
9/11/81	2000	7000.0	7.7	7.8	20	60	27	81	8	44	
9/11/81	2015	7000.0	8.0	7.6	25	55	34	76	11	41	
9/11/81	2030	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	2045	.0	.0	.0	0	0	0	0	0	0	C
9/11/81	2100	7000.0	8.0	7.5	52	52	72	72	23	39	
9/11/81	2115	7000.0	8.0	7.5	26	55	36	76	11	41	
9/11/81	2130	7000.0	7.7	7.7	23	57	31	77	10	41	
9/11/81	2145	7000.0	8.1	7.5	20	56	27	78	9	42	
9/11/81	2200	7000.0	8.2	7.4	28	53	39	74	12	40	
9/11/81	2215	7000.0	7.8	7.7	19	58	25	79	8	42	
9/11/81	2230	7000.0	7.9	7.6	23	56	31	77	10	41	
9/11/81	2245	7000.0	7.9	7.6	26	50	35	68	11	37	
9/11/81	2300	7000.0	8.1	7.5	64	50	89	69	29	37	
9/11/81	2315	7000.0	8.2	7.4	33	53	46	74	15	40	
9/11/81	2330	7000.0	8.1	7.4	52	50	72	69	23	37	
9/11/81	2345	7000.0	8.1	7.5	41	52	57	72	18	39	
9/11/81	2400	7000.0	8.2	7.4	23	50	32	70	10	38	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/12/81	15	7000.0	7.8	7.7	49	53	66	72	22	39	
9/12/81	30	.0	.0	.0	0	0	0	0	0	0	C
9/12/81	45	.0	.0	.0	0	0	0	0	0	0	C
9/12/81	100	7000.0	8.1	7.5	50	51	69	71	23	38	
9/12/81	115	7000.0	8.4	7.3	19	56	27	80	8	43	
9/12/81	130	7000.0	8.2	7.4	31	54	43	76	14	41	
9/12/81	145	7000.0	7.9	7.7	33	55	45	75	14	41	
9/12/81	200	7000.0	8.5	7.2	70	48	101	69	33	37	
9/12/81	215	7000.0	8.8	7.2	51	48	73	68	24	37	
9/12/81	230	7000.0	8.0	7.5	26	54	36	74	11	40	
9/12/81	245	7000.0	8.1	7.5	44	52	61	72	20	39	
9/12/81	300	7000.0	8.4	7.3	65	48	93	68	30	37	
9/12/81	315	7000.0	8.3	7.3	39	50	55	71	18	38	
9/12/81	330	7000.0	8.4	7.3	61	48	87	68	28	37	
9/12/81	345	7000.0	8.1	7.4	39	52	54	72	17	39	
9/12/81	400	7000.0	8.2	7.4	37	52	52	73	17	39	
9/12/81	415	7000.0	8.7	7.1	37	50	54	73	17	39	
9/12/81	430	7000.0	7.1	7.2	0	55	0	71	0	38	
9/12/81	445	7000.0	8.1	7.5	36	52	50	72	16	39	
9/12/81	500	7000.0	8.5	7.2	49	49	70	70	23	38	
9/12/81	515	7000.0	8.5	7.2	0	47	0	67	0	36	
9/12/81	530	7000.0	8.4	7.2	0	46	0	65	0	35	
9/12/81	545	7000.0	8.5	7.2	37	48	53	69	17	37	
9/12/81	600	7000.0	8.7	7.2	23	48	33	70	11	38	
9/12/81	615	7000.0	10.7	5.6	0	37	0	64	0	35	
9/12/81	630	7000.0	9.1	6.8	10	44	15	66	4	36	
9/12/81	645	7000.0	8.7	7.1	31	46	45	67	14	36	
9/12/81	700	7000.0	8.5	7.2	0	46	0	66	0	36	
9/12/81	715	7000.0	8.1	7.5	0	54	0	75	0	40	
9/12/81	730	7000.0	7.9	7.7	25	56	34	77	11	41	
9/12/81	745	7000.0	8.2	7.4	17	57	23	80	7	43	
9/12/81	800	7000.0	7.8	7.6	0	59	0	80	0	43	
9/12/81	815	7000.0	8.0	7.6	21	56	29	77	9	42	
9/12/81	830	.0	.0	.0	0	0	0	0	0	0	C
9/12/81	845	7000.0	8.7	7.1	23	52	33	76	11	41	
9/12/81	900	7000.0	8.5	7.2	52	50	75	72	24	39	
9/12/81	915	7000.0	8.6	7.2	26	53	37	77	12	41	
9/12/81	930	7000.0	8.5	7.3	16	56	23	80	7	43	
9/12/81	945	7000.0	8.5	7.3	14	58	20	83	6	45	
9/12/81	1000	7000.0	8.1	7.5	14	60	19	83	6	45	
9/12/81	1015	7000.0	8.7	7.2	16	55	23	80	7	43	
9/12/81	1030	7000.0	8.3	7.4	19	56	26	79	8	43	
9/12/81	1045	7000.0	8.8	7.1	23	52	34	76	11	41	
9/12/81	1100	7000.0	8.3	7.4	15	57	21	80	7	43	
9/12/81	1115	7000.0	8.8	7.1	15	55	22	81	7	44	
9/12/81	1130	7000.0	8.6	7.3	13	59	18	85	6	46	
9/12/81	1145	7000.0	8.4	7.4	13	59	18	84	6	45	
9/12/81	1200	7000.0	8.6	7.2	12	59	17	85	5	46	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/12/81	1215	7000.0	8.7	7.2	12	60	17	88	5	47	
9/12/81	1230	.0	.0	.0	0	0	0	0	0	0	C
9/12/81	1245	7000.0	8.8	7.1	16	61	23	90	7	48	
9/12/81	1300	7000.0	8.6	7.3	24	57	34	82	11	44	
9/12/81	1315	7000.0	9.1	6.9	45	50	68	75	22	41	
9/12/81	1330	7000.0	8.7	7.2	24	57	35	83	11	45	
9/12/81	1345	7000.0	8.6	7.3	29	55	42	80	13	43	
9/12/81	1400	7000.0	8.7	7.2	42	52	61	76	20	41	
9/12/81	1415	7000.0	8.2	7.5	18	59	25	83	8	45	
9/12/81	1430	7000.0	8.6	7.3	26	55	37	80	12	43	
9/12/81	1445	7000.0	8.2	7.5	16	59	22	83	7	45	
9/12/81	1500	7000.0	8.1	7.5	46	54	64	75	21	40	
9/12/81	1515	7000.0	8.4	7.4	26	55	37	78	12	42	
9/12/81	1530	7000.0	8.5	7.3	29	53	41	76	13	41	
9/12/81	1545	7000.0	8.4	7.3	31	52	44	74	14	40	
9/12/81	1600	7000.0	8.7	7.1	62	49	90	71	29	39	
9/12/81	1615	7000.0	8.3	7.4	0	53	0	75	0	40	
9/12/81	1630	7000.0	8.9	7.1	26	49	38	73	12	39	
9/12/81	1645	7000.0	8.9	7.0	9	48	13	71	4	38	
9/12/81	1700	7000.0	8.6	7.2	0	49	0	71	0	38	
9/12/81	1715	7000.0	8.6	7.1	19	48	27	69	9	37	
9/12/81	1730	7000.0	8.5	7.3	58	50	83	72	27	39	
9/12/81	1745	7000.0	8.4	7.3	50	51	71	73	23	39	
9/12/81	1800	7000.0	8.4	7.3	53	50	75	71	24	38	
9/12/81	1815	7000.0	8.8	7.1	12	48	17	71	5	38	
9/12/81	1830	7000.0	8.5	7.2	9	49	12	70	4	38	
9/12/81	1845	7000.0	8.1	7.5	51	51	71	71	23	38	
9/12/81	1900	7000.0	8.3	7.4	0	49	0	69	0	37	
9/12/81	1915	7000.0	8.6	7.2	0	47	0	68	0	37	
9/12/81	1930	7000.0	8.7	7.1	14	47	20	68	6	37	
9/12/81	1945	7000.0	8.5	7.2	0	46	0	66	0	36	
9/12/81	2000	7000.0	8.4	7.3	68	48	97	68	32	37	
9/12/81	2015	7000.0	8.4	7.3	1	49	1	70	0	38	
9/12/81	2030	.0	.0	.0	0	0	0	0	0	0	C
9/12/81	2045	7000.0	8.1	7.5	55	48	76	67	25	36	
9/12/81	2100	7000.0	8.0	7.5	10	46	13	63	4	34	
9/12/81	2115	7000.0	8.3	7.4	17	49	24	69	7	37	
9/12/81	2130	7000.0	8.3	7.4	5	49	7	69	2	37	
9/12/81	2145	7000.0	8.5	7.2	0	47	0	67	0	36	
9/12/81	2200	7000.0	8.8	7.1	0	46	0	68	0	36	
9/12/81	2215	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2230	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2245	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2300	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2315	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2330	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2345	.0	.0	.0	0	0	0	0	0	0	K
9/12/81	2400	.0	.0	.0	0	0	0	0	0	0	K

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/14/81	15	7000.0	7.3	7.8	9	63	11	82	3	44	
9/14/81	30	7000.0	7.2	7.9	8	64	10	83	3	45	
9/14/81	45	7000.0	7.7	7.5	8	61	10	82	3	44	
9/14/81	100	7000.0	7.4	7.8	9	63	11	83	3	45	
9/14/81	115	7000.0	7.7	7.6	9	63	12	85	4	46	
9/14/81	130	7000.0	8.1	7.3	8	61	11	85	3	46	
9/14/81	145	7000.0	7.6	7.6	8	63	10	84	3	45	
9/14/81	200	7000.0	7.7	7.5	10	63	13	85	4	46	
9/14/81	215	7000.0	7.3	7.8	9	65	11	85	3	46	
9/14/81	230	7000.0	7.6	7.6	9	63	12	84	3	45	
9/14/81	245	7000.0	7.5	7.6	9	61	12	81	3	44	
9/14/81	300	7000.0	7.5	7.6	9	61	12	81	3	44	
9/14/81	315	7000.0	7.3	7.7	9	65	11	85	3	46	
9/14/81	330	7000.0	7.5	7.6	8	63	10	84	3	45	
9/14/81	345	7000.0	6.7	8.1	8	63	10	79	3	43	
9/14/81	400	7000.0	6.5	8.3	11	64	13	79	4	43	
9/14/81	415	.0	.0	.0	0	0	0	0	0	0	C
9/14/81	430	7000.0	6.9	8.1	8	65	10	83	3	45	
9/14/81	445	7000.0	7.0	8.0	8	66	10	84	3	46	
9/14/81	500	7000.0	6.8	8.0	9	64	11	81	3	44	
9/14/81	515	7000.0	6.7	8.2	8	60	10	75	3	41	
9/14/81	530	7000.0	6.5	8.2	8	59	9	73	3	39	
9/14/81	545	7000.0	6.8	8.2	8	62	10	78	3	42	
9/14/81	600	7000.0	7.0	8.1	9	62	11	79	3	43	
9/14/81	615	7000.0	7.6	8.0	17	68	22	91	7	49	
9/14/81	630	7000.0	7.6	8.1	17	69	22	92	7	50	
9/14/81	645	7000.0	7.4	8.0	15	69	19	91	6	49	
9/14/81	700	7000.0	8.8	7.1	15	68	22	100	7	54	
9/14/81	715	7000.0	8.3	7.4	15	68	21	96	7	52	
9/14/81	730	7000.0	7.5	8.0	17	61	22	81	7	44	
9/14/81	745	7000.0	7.4	7.8	18	65	23	86	7	46	
9/14/81	800	7000.0	7.5	7.8	18	66	24	88	7	47	
9/14/81	815	7000.0	7.7	7.9	17	62	23	84	7	45	
9/14/81	830	7000.0	8.1	7.8	16	64	22	89	7	48	
9/14/81	845	7000.0	7.6	8.0	18	67	24	90	7	48	
9/14/81	900	7000.0	7.8	7.9	17	68	23	92	7	50	
9/14/81	915	7000.0	7.4	8.0	14	68	18	90	6	48	
9/14/81	930	7000.0	7.4	8.0	15	65	19	86	6	46	
9/14/81	945	7000.0	7.6	7.8	15	66	20	88	6	48	
9/14/81	1000	7000.0	7.1	8.2	14	67	18	86	5	47	
9/14/81	1015	7000.0	6.7	8.3	13	67	16	84	5	45	
9/14/81	1030	7000.0	8.2	7.6	14	64	19	90	6	48	
9/14/81	1045	7000.0	8.7	7.6	14	64	20	93	6	50	
9/14/81	1100	7000.0	7.3	8.2	14	69	18	90	6	49	
9/14/81	1115	7000.0	7.8	7.9	15	67	20	91	6	49	
9/14/81	1130	7000.0	7.5	8.0	14	67	18	89	6	48	
9/14/81	1145	7000.0	7.5	8.0	14	68	18	90	6	49	
9/14/81	1200	7000.0	7.6	8.0	14	68	18	91	6	49	

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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                         **
**                                          15 MIN. DATA                                      **
**                                 DRY STACK GAS CONCENTRATION                                **
**                            O2      CO2     CO      NO      CO      NO      CO      NO  ACODE **
**                   LOAD    VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J       **
**  DATE     TIME     B/D    MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                       **
************************************************************************************************
** 9/14/81   1215       .0      .0      .0      0       0       0       0       0       0  C    **
** 9/14/81   1230       .0      .0      .0      0       0       0       0       0       0  C    **
** 9/14/81   1245   7000.0     7.7     7.9     16      67      21      90       7      49       **
** 9/14/81   1300   7000.0     7.5     8.1     17      69      22      92       7      50       **
** 9/14/81   1315   7000.0     7.6     8.0     17      70      22      94       7      51       **
** 9/14/81   1330   7000.0     7.6     8.0     17      69      22      92       7      50       **
** 9/14/81   1345   7000.0     7.4     8.1     17      69      22      91       7      49       **
** 9/14/81   1400   7000.0     7.4     8.0     17      69      22      91       7      49       **
** 9/14/81   1415   7000.0     8.8     7.1     17      61      25      90       8      48       **
** 9/14/81   1430   7000.0     8.4     7.4     17      60      24      85       8      46       **
** 9/14/81   1445   7000.0     7.5     8.0     19      65      25      86       8      47       **
** 9/14/81   1500   7000.0     7.4     8.0     18      67      23      88       7      48       **
** 9/14/81   1515   7000.0     7.5     7.8     18      62      24      82       7      44       **
** 9/14/81   1530   7000.0     7.7     7.8     18      63      24      85       8      46       **
** 9/14/81   1545   7000.0     8.1     7.5     18      63      25      88       8      47       **
** 9/14/81   1600   7000.0     7.6     7.9     18      67      24      90       7      48       **
** 9/14/81   1615   7000.0     7.8     7.8     17      66      23      90       7      48       **
** 9/14/81   1630   7000.0     7.4     8.0     18      68      23      90       7      48       **
** 9/14/81   1645   7000.0     7.5     7.9     18      68      24      90       7      49       **
** 9/14/81   1700   7000.0     7.4     8.0     18      67      23      88       7      48       **
** 9/14/81   1715   7000.0     7.4     8.0     18      66      23      87       7      47       **
** 9/14/81   1730   7000.0     7.6     7.8     18      65      24      87       7      47       **
** 9/14/81   1745   7000.0     7.1     8.2     19      67      24      86       8      47       **
** 9/14/81   1800   7000.0     6.7     8.3     16      67      20      84       6      45       **
** 9/14/81   1815   7000.0     7.0     8.0      0      52       0      66       0      36       **
** 9/14/81   1830   7000.0     6.5     8.2     20      57      24      70       8      38       **
** 9/14/81   1845   7000.0     6.7     8.2     13      60      16      75       5      41       **
** 9/14/81   1900   7000.0     6.8     8.0     10      64      12      81       4      44       **
** 9/14/81   1915   7000.0     7.0     8.0     11      66      14      84       4      46       **
** 9/14/81   1930   7000.0     6.9     8.0     11      67      14      85       4      46       **
** 9/14/81   1945   7000.0     6.8     8.1     12      65      15      82       5      44       **
** 9/14/81   2000   7000.0     6.4     8.3     12      67      14      82       4      44       **
** 9/14/81   2015       .0      .0      .0      0       0       0       0       0       0  C    **
** 9/14/81   2030   7000.0     6.7     8.1      9      63      11      79       3      43       **
** 9/14/81   2045   7000.0     7.5     7.6      9      63      12      84       3      45       **
** 9/14/81   2100   7000.0     7.3     7.7      9      65      11      85       3      46       **
** 9/14/81   2115   7000.0     7.5     7.6      9      61      12      81       3      44       **
** 9/14/81   2130   7000.0     7.5     7.6      9      61      12      81       3      44       **
** 9/14/81   2145   7000.0     7.6     7.6      9      63      12      84       3      45       **
** 9/14/81   2200   7000.0     7.3     7.8      8      65      10      85       3      46       **
** 9/14/81   2215   7000.0     7.7     7.5      9      63      12      85       4      46       **
** 9/14/81   2230   7000.0     7.6     7.6      9      63      12      84       3      45       **
** 9/14/81   2245   7000.0     8.1     7.3      8      61      11      85       3      46       **
** 9/14/81   2300   7000.0     7.7     7.6      9      63      12      85       4      46       **
** 9/14/81   2315   7000.0     7.4     7.8      9      63      11      83       3      45       **
** 9/14/81   2330   7000.0     7.7     7.5      9      61      12      82       4      44       **
** 9/14/81   2345   7000.0     7.2     7.9      8      64      10      83       3      45       **
** 9/14/81   2400   7000.0     7.3     7.8      9      63      11      82       3      44       **
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**                              PETROLEUM PROCESS HEATER, LOW NOX BURNERS                         **
**                                            15 MIN. DATA                                        **
**                                     DRY STACK GAS CONCENTRATION                                **
**                            O2     CO2      CO      NO      CO      NO      CO      NO ACODE    **
**                    LOAD    VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J          **
**    DATE  TIME     B/D    MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                          **
****************************************************************************************************
** 9/15/81    15  7000.0     6.3     8.1      10      76      12      93       4      50          **
** 9/15/81    30  7000.0     6.1     8.1      16      73      19      88       6      47          **
** 9/15/81    45  7000.0     5.9     8.3      14      72      16      85       5      46          **
** 9/15/81   100  7000.0     6.1     8.3      13      68      15      82       5      44          **
** 9/15/81   115  7000.0     8.1     8.1       8      64      11      89       3      48          **
** 9/15/81   130  7000.0     7.3     8.3       6      68       7      89       2      48          **
** 9/15/81   145  7000.0     7.4     8.4       6      68       7      90       2      48          **
** 9/15/81   200  7000.0     6.9     8.2      10      66      12      84       4      45          **
** 9/15/81   215  7000.0     7.1     8.5      15      67      19      86       6      47          **
** 9/15/81   230  7000.0     7.3     8.8      15      69      19      90       6      49          **
** 9/15/81   245  7000.0     7.3     8.9      13      69      17      90       5      49          **
** 9/15/81   300  7000.0     6.9     9.1      16      70      20      89       6      48          **
** 9/15/81   315  7000.0     6.8     9.1      14      76      17      96       5      52          **
** 9/15/81   330  7000.0     6.8     9.3       9      71      11      90       3      48          **
** 9/15/81   345  7000.0     7.1     8.8      10      71      12      92       4      49          **
** 9/15/81   400      .0      .0      .0       0       0       0       0       0       0     C    **
** 9/15/81   415      .0      .0      .0       0       0       0       0       0       0     C    **
** 9/15/81   430  7000.0     6.8     8.5      11      73      13      92       4      50          **
** 9/15/81   445  7000.0     6.3     8.8      18      75      22      91       7      49          **
** 9/15/81   500  7000.0     6.1     8.8      15      76      18      91       5      49          **
** 9/15/81   515  7000.0     5.8     9.1      14      76      16      90       5      48          **
** 9/15/81   530  7000.0     5.9     9.1      10      73      11      87       3      47          **
** 9/15/81   545  7000.0     5.2     9.3      13      72      14      82       4      44          **
** 9/15/81   600  7000.0     6.1     8.8      11      68      13      82       4      44          **
** 9/15/81   615  7000.0     6.0     9.0      15      76      18      91       5      49          **
** 9/15/81   630  7000.0     6.5     8.6      16      73      19      90       6      49          **
** 9/15/81   645  7000.0     6.5     8.6      16      73      19      90       6      49          **
** 9/15/81   700  7000.0     6.6     8.5      16      73      20      91       6      49          **
** 9/15/81   715  7000.0     6.7     8.6      16      71      20      89       6      48          **
** 9/15/81   730  7000.0     6.6     8.5      18      73      22      91       7      49          **
** 9/15/81   745  7000.0     6.5     8.6      19      73      23      90       7      49          **
** 9/15/81   800  7000.0     6.4     8.6      21      75      25      92       8      50          **
** 9/15/81   815  7000.0     6.3     8.7      16      75      19      91       6      49          **
** 9/15/81   830  7000.0     6.4     8.7      17      74      20      91       6      49          **
** 9/15/81   845  7000.0     6.6     8.5      17      75      21      93       7      50          **
** 9/15/81   900  7000.0     6.3     8.7      17      75      20      91       6      49          **
** 9/15/81   915  7000.0     6.1     8.8      18      72      21      87       7      47          **
** 9/15/81   930  7000.0     5.9     8.9      19      69      22      82       7      44          **
** 9/15/81   945  7000.0     5.8     8.9      21      67      24      79       8      43          **
** 9/15/81  1000  7000.0     4.8     9.4      16      68      17      75       5      41          **
** 9/15/81  1015  7000.0     5.1     9.4      16      69      18      78       5      42          **
** 9/15/81  1030  7000.0     5.2     9.4      16      65      18      74       6      40          **
** 9/15/81  1045  7000.0     6.4     8.8      16      71      19      87       6      47          **
** 9/15/81  1100  7000.0     6.3     8.8      14      71      17      87       5      47          **
** 9/15/81  1115  7000.0     5.1     9.2      15      68      16      77       5      41          **
** 9/15/81  1130  7000.0     4.9     9.4      16      67      17      74       5      40          **
** 9/15/81  1145  7000.0     4.9     9.5      18      65      20      72       6      39          **
** 9/15/81  1200  7000.0     4.9     9.5      18      65      20      72       6      39          **
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**                              PETROLEUM PROCESS HEATER, LOW NOX BURNERS                                 **
**                                            15 MIN. DATA                                                **
**                                     DRY STACK GAS CONCENTRATION                                        **
**                             O2     CO2      CO      NO      CO      NO      CO      NO  ACODE          **
**                  LOAD     VOL%    VOL%    PPMV    PPMV    PPMV    PPMV    NG/J    NG/J                 **
**  DATE    TIME     B/D     MEAS    MEAS    MEAS    MEAS    3%O2    3%O2                                 **
************************************************************************************************************
** 9/15/81  1215        .0     .0      .0       0       0       0       0       0       0  C              **
** 9/15/81  1230    7000.0    8.1     7.5      13      64      18      89       5      48                 **
** 9/15/81  1245    7000.0    7.3     8.1      13      68      17      89       5      48                 **
** 9/15/81  1300    7000.0    7.4     8.0      13      68      17      90       5      48                 **
** 9/15/81  1315    7000.0    6.9     8.3      14      66      17      84       5      45                 **
** 9/15/81  1330    7000.0    7.1     8.1      13      67      16      86       5      47                 **
** 9/15/81  1345    7000.0    7.3     8.1       5      69       6      90       2      49                 **
** 9/15/81  1400    7000.0    7.3     8.1       6      69       7      90       2      49                 **
** 9/15/81  1415    7000.0    6.9     8.3      13      70      16      89       5      48                 **
** 9/15/81  1430    7000.0    6.8     8.3      15      76      19      96       6      52                 **
** 9/15/81  1445    7000.0    6.8     8.4      15      71      19      90       6      48                 **
** 9/15/81  1500    7000.0    7.1     8.2      15      71      19      92       6      49                 **
** 9/15/81  1515    7000.0    6.8     8.5      15      73      19      92       6      50                 **
** 9/15/81  1530    7000.0    6.3     8.8      16      75      19      91       6      49                 **
** 9/15/81  1545    7000.0    6.1     8.9      16      76      19      91       6      49                 **
** 9/15/81  1600    7000.0    5.8     9.1      20      76      23      90       7      48                 **
** 9/15/81  1615    7000.0    5.9     9.1      17      73      20      87       6      47                 **
** 9/15/81  1630    7000.0    5.2     9.3      17      72      19      82       6      44                 **
** 9/15/81  1645    7000.0    6.1     8.8      18      68      21      82       7      44                 **
** 9/15/81  1700    7000.0    5.4     8.9      13      53      15      61       4      33                 **
** 9/15/81  1715    7000.0    6.1     8.4       0      48       0      58       0      31                 **
** 9/15/81  1730    7000.0    5.4     9.0      30      53      34      61      11      33                 **
** 9/15/81  1745    7000.0    3.8    10.1       0      70       0      73       0      39                 **
** 9/15/81  1800    7000.0    4.1     9.9       0      66       0      70       0      38                 **
** 9/15/81  1815    7000.0    4.1     9.9      41      65      43      69      14      37                 **
** 9/15/81  1830    7000.0    4.9     9.5      16      69      17      77       5      41                 **
** 9/15/81  1845    7000.0    5.1     9.4      18      68      20      77       6      41                 **
** 9/15/81  1900    7000.0    5.2     9.3       9      62      10      70       3      38                 **
** 9/15/81  1915    7000.0    4.9     9.4      11      58      12      64       4      35                 **
** 9/15/81  1930    7000.0    5.2     9.3      23      63      26      71       8      38                 **
** 9/15/81  1945    7000.0    5.1     9.3      18      67      20      75       6      41                 **
** 9/15/81  2000    7000.0    4.8     9.5      48      62      53      68      17      37                 **
** 9/15/81  2015    7000.0    5.8     8.9      39      59      46      69      15      37                 **
** 9/15/81  2030    7000.0    5.9     8.9      19      69      22      82       7      44                 **
** 9/15/81  2045    7000.0    6.2     8.7      19      72      23      87       7      47                 **
** 9/15/81  2100    7000.0    6.1     8.8      18      75      21      90       7      49                 **
** 9/15/81  2115    7000.0    6.3     8.7      18      75      22      91       7      49                 **
** 9/15/81  2130    7000.0    6.6     8.5      19      74      23      92       7      50                 **
** 9/15/81  2145    7000.0    6.4     8.7      18      75      22      92       7      50                 **
** 9/15/81  2200    7000.0    6.3     8.7      18      75      22      91       7      49                 **
** 9/15/81  2215        .0     .0      .0       0       0       0       0       0       0  C              **
** 9/15/81  2230    7000.0    6.4     8.6      14      73      17      90       5      48                 **
** 9/15/81  2245    7000.0    6.7     8.6      15      73      18      92       6      49                 **
** 9/15/81  2300    7000.0    6.6     8.5      16      71      20      88       6      48                 **
** 9/15/81  2315    7000.0    6.6     8.5      16      73      20      91       6      49                 **
** 9/15/81  2330    7000.0    6.5     8.6      16      73      19      90       6      49                 **
** 9/15/81  2345    7000.0    6.5     8.6      16      73      19      90       6      49                 **
** 9/15/81  2400    7000.0    6.0     9.0      16      76      19      91       6      49                 **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/16/81	15	7000.0	6.0	8.9	16	75	19	90	6	48	
9/16/81	30	7000.0	5.9	9.0	16	75	19	89	6	48	
9/16/81	45	7000.0	5.9	9.0	16	75	19	89	6	48	
9/16/81	100	7000.0	5.8	9.1	16	76	18	90	6	48	
9/16/81	115	7000.0	5.9	9.0	16	74	19	88	6	47	
9/16/81	130	7000.0	5.7	9.1	15	75	17	88	5	47	
9/16/81	145	7000.0	5.8	9.0	15	75	17	88	5	48	
9/16/81	200	7000.0	5.7	9.1	16	75	18	88	6	47	
9/16/81	215	7000.0	5.6	9.2	15	75	17	87	5	47	
9/16/81	230	7000.0	5.7	9.1	16	74	18	87	6	47	
9/16/81	245	7000.0	5.7	9.2	16	75	18	88	6	47	
9/16/81	300	7000.0	5.8	9.1	16	76	18	90	6	48	
9/16/81	315	7000.0	5.9	9.0	16	75	19	89	6	48	
9/16/81	330	7000.0	5.9	9.0	16	75	19	89	6	48	
9/16/81	345	7000.0	5.7	9.1	16	75	18	88	6	47	
9/16/81	400	7000.0	5.9	9.0	17	75	20	89	6	48	
9/16/81	415	7000.0	5.9	9.0	17	74	20	88	6	47	
9/16/81	430	7000.0	5.9	8.9	16	74	19	88	6	47	
9/16/81	445	7000.0	5.9	8.9	16	73	19	87	6	47	
9/16/81	500	7000.0	6.1	8.9	16	73	19	88	6	47	
9/16/81	515	7000.0	5.9	9.0	16	74	19	88	6	47	
9/16/81	530	7000.0	6.1	8.9	17	73	20	88	6	47	
9/16/81	545	7000.0	5.8	9.1	17	74	20	87	6	47	
9/16/81	600	.0	.0	.0	0	0	0	0	0	0	C
9/16/81	615	7000.0	5.0	8.5	19	72	21	81	7	43	
9/16/81	630	7000.0	5.3	9.4	17	76	19	87	6	47	
9/16/81	645	7000.0	5.2	9.5	16	76	18	86	6	47	
9/16/81	700	7000.0	5.5	9.2	16	75	18	87	6	47	
9/16/81	715	7000.0	5.7	9.2	16	75	18	88	6	47	
9/16/81	730	7000.0	5.9	9.0	15	75	17	89	5	48	
9/16/81	745	7000.0	5.8	9.1	15	74	17	87	5	47	
9/16/81	800	7000.0	5.5	9.3	15	76	17	88	5	47	
9/16/81	815	7000.0	5.6	9.2	15	75	17	87	5	47	
9/16/81	830	7000.0	6.0	8.9	15	73	18	87	5	47	
9/16/81	845	7000.0	7.1	8.2	14	69	18	89	5	48	
9/16/81	900	7000.0	7.2	8.2	14	69	18	90	6	48	
9/16/81	915	7000.0	7.0	8.4	15	71	19	91	6	49	
9/16/81	930	7000.0	6.7	8.5	15	72	18	90	6	49	
9/16/81	945	7000.0	6.9	8.4	14	71	17	90	5	49	
9/16/81	1000	7000.0	6.8	8.5	14	72	17	91	5	49	
9/16/81	1015	7000.0	6.8	8.5	14	72	17	91	5	49	
9/16/81	1030	7000.0	6.7	8.5	13	71	16	89	5	48	
9/16/81	1045	7000.0	6.8	8.5	14	71	17	90	5	48	
9/16/81	1100	7000.0	6.6	8.6	13	72	16	90	5	48	
9/16/81	1115	7000.0	6.4	8.7	14	72	17	88	5	48	
9/16/81	1130	7000.0	6.2	8.9	14	73	17	88	5	48	
9/16/81	1145	7000.0	6.2	8.9	14	73	17	88	5	48	
9/16/81	1200	7000.0	6.3	8.8	13	73	15	89	5	48	

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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                          **
**                                       15 MIN. DATA                                          **
**                              DRY STACK GAS CONCENTRATION                                    **
**                               O2     CO2     CO      NO      CO      NO      CO      NO  ACODE **
**                      LOAD    VOL%    VOL%   PPMV    PPMV    PPMV    PPMV    NG/J    NG/J     **
**   DATE     TIME       B/D    MEAS    MEAS   MEAS    MEAS    3%O2    3%O2                     **
*************************************************************************************************
** 9/16/81    1215    7000.0    6.3     8.8     14      73      17      89       5      48       **
** 9/16/81    1230    7000.0    6.1     8.9     13      74      15      89       5      48       **
** 9/16/81    1245    7000.0    6.0     9.0     13      74      15      88       5      48       **
** 9/16/81    1300    7000.0    6.0     9.0     14      74      16      88       5      48       **
** 9/16/81    1315    7000.0    5.7     9.2     14      75      16      88       5      47       **
** 9/16/81    1330    7000.0    5.7     9.2     13      75      15      88       5      47       **
** 9/16/81    1345    7000.0    5.8     9.1     14      74      16      87       5      47       **
** 9/16/81    1400    7000.0    5.3     9.4     14      76      16      87       5      47       **
** 9/16/81    1415        .0     .0      .0      0       0       0       0       0       0   C   **
** 9/16/81    1430    7000.0    5.8     9.1     18      76      21      90       7      48       **
** 9/16/81    1445    7000.0    5.8     9.1     18      77      21      91       7      49       **
** 9/16/81    1500    7000.0    5.6     9.2     17      78      19      91       6      49       **
** 9/16/81    1515    7000.0    5.4     9.4     18      78      20      90       6      48       **
** 9/16/81    1530    7000.0    5.4     9.4     18      77      20      88       6      48       **
** 9/16/81    1545    7000.0    4.9     9.7     18      78      20      87       6      47       **
** 9/16/81    1600    7000.0    5.1     9.5     19      76      21      86       7      46       **
** 9/16/81    1615    7000.0    5.4     9.3     19      78      21      90       7      48       **
** 9/16/81    1630    7000.0    5.3     9.4     19      79      21      90       7      49       **
** 9/16/81    1645    7000.0    4.9     9.6     20      79      22      88       7      47       **
** 9/16/81    1700    7000.0    5.4     9.3     19      78      21      90       7      48       **
** 9/16/81    1715    7000.0    5.3     9.3     19      78      21      89       7      48       **
** 9/16/81    1730    7000.0    5.5     9.2     20      76      23      88       7      47       **
** 9/16/81    1745    7000.0    5.3     9.4     19      76      21      87       7      47       **
** 9/16/81    1800    7000.0    5.4     9.3     20      77      23      88       7      48       **
** 9/16/81    1815    7000.0    5.5     9.2     19      76      22      88       7      47       **
** 9/16/81    1830    7000.0    5.3     9.3     20      75      22      86       7      46       **
** 9/16/81    1845    7000.0    5.5     9.2     19      77      22      89       7      48       **
** 9/16/81    1900    7000.0    5.9     9.0     19      75      22      89       7      48       **
** 9/16/81    1915    7000.0    5.6     9.1     19      75      22      87       7      47       **
** 9/16/81    1930    7000.0    6.0     8.9     20      75      24      90       7      48       **
** 9/16/81    1945    7000.0    5.9     9.0     21      76      25      90       8      49       **
** 9/16/81    2000        .0     .0      .0      0       0       0       0       0       0   C   **
** 9/16/81    2015    7000.0    5.9     9.0     21      77      25      91       8      49       **
** 9/16/81    2030    7000.0    5.8     9.0     21      77      24      91       8      49       **
** 9/16/81    2045    7000.0    6.0     8.9     21      77      25      92       8      50       **
** 9/16/81    2100    7000.0    5.7     9.1     21      79      24      93       8      50       **
** 9/16/81    2115    7000.0    6.0     8.9     21      77      25      92       8      50       **
** 9/16/81    2130    7000.0    5.8     9.0     21      78      24      92       8      50       **
** 9/16/81    2145    7000.0    5.8     9.0     21      78      24      92       8      50       **
** 9/16/81    2200    7000.0    5.7     9.1     21      78      24      91       8      49       **
** 9/16/81    2215    7000.0    5.1     8.6     17      77      19      87       6      47       **
** 9/16/81    2230    7000.0    5.8     9.0     17      76      20      90       6      48       **
** 9/16/81    2245    7000.0    5.9     9.0     16      76      19      90       6      49       **
** 9/16/81    2300    7000.0    5.8     9.1     16      75      18      88       6      48       **
** 9/16/81    2315    7000.0    5.7     9.1     16      75      18      88       6      47       **
** 9/16/81    2330    7000.0    5.9     9.0     17      75      20      89       6      48       **
** 9/16/81    2345    7000.0    6.0     9.0     16      75      19      90       6      48       **
** 9/16/81    2400    7000.0    6.0     9.0     16      74      19      88       6      48       **
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**                          PETROLEUM PROCESS HEATER, LOW NOX BURNERS                            **
**                                          15 MIN. DATA                                         **
**                                  DRY STACK GAS CONCENTRATION                                   **
**                              O2      CO2      CO       NO       CO       NO       CO      NO  ACODE **
**                    LOAD     VOL%     VOL%    PPMV     PPMV     PPMV     PPMV     NG/J    NG/J       **
**   DATE     TIME    B/D      MEAS     MEAS    MEAS     MEAS     3%O2     3%O2                        **
****************************************************************************************************
** 9/17/81     15   7000.0     5.8      9.1      16       74       18       87        6      47        **
** 9/17/81     30   7000.0     5.7      9.1      16       75       18       88        6      47        **
** 9/17/81     45   7000.0     5.9      9.0      16       73       19       87        6      47        **
** 9/17/81    100   7000.0     6.0      9.0      16       73       19       87        6      47        **
** 9/17/81    115   7000.0     6.3      8.8      16       72       19       88        6      47        **
** 9/17/81    130   7000.0     6.0      9.0      16       74       19       88        6      48        **
** 9/17/81    145   7000.0     6.2      8.9      16       73       19       88        6      48        **
** 9/17/81    200   7000.0     6.2      8.8      16       72       19       87        6      47        **
** 9/17/81    215   7000.0     6.2      8.8      16       72       19       87        6      47        **
** 9/17/81    230   7000.0     6.5      8.6      16       70       19       87        6      47        **
** 9/17/81    245   7000.0     6.7      8.5      16       68       20       85        6      46        **
** 9/17/81    300   7000.0     6.5      8.6      16       68       19       84        6      45        **
** 9/17/81    315   7000.0     6.5      8.6      16       69       19       85        6      46        **
** 9/17/81    330   7000.0     6.3      8.7      16       69       19       84        6      45        **
** 9/17/81    345   7000.0     6.3      8.7      16       69       19       84        6      45        **
** 9/17/81    400   7000.0     6.5      8.6      16       69       19       85        6      46        **
** 9/17/81    415   7000.0     6.3      8.7      16       70       19       85        6      46        **
** 9/17/81    430   7000.0     6.5      8.6      16       69       19       85        6      46        **
** 9/17/81    445   7000.0     6.5      8.6      16       69       19       85        6      46        **
** 9/17/81    500   7000.0     6.3      8.7      16       70       19       85        6      46        **
** 9/17/81    515   7000.0     6.5      8.6      16       67       19       83        6      45        **
** 9/17/81    530   7000.0     6.3      8.8      16       69       19       84        6      45        **
** 9/17/81    545   7000.0     6.4      8.7      16       69       19       85        6      46        **
** 9/17/81    600       .0      .0       .0       0        0        0        0        0       0   C    **
** 9/17/81    615   7000.0     5.9      9.1      12       77       14       91        4      49        **
** 9/17/81    630   7000.0     6.1      8.9      17       72       20       87        6      47        **
** 9/17/81    645   7000.0     6.4      8.7      17       71       20       87        6      47        **
** 9/17/81    700   7000.0     6.3      8.8      17       71       20       87        6      47        **
** 9/17/81    715   7000.0     6.1      8.9      17       72       20       87        6      47        **
** 9/17/81    730   7000.0     5.9      9.0      17       73       20       87        6      47        **
** 9/17/81    745   7000.0     6.1      8.9      17       73       20       88        6      47        **
** 9/17/81    800   7000.0     6.2      8.9      16       73       19       88        6      48        **
** 9/17/81    815   7000.0     6.2      8.9      16       73       19       88        6      48        **
** 9/17/81    830   7000.0     6.2      9.0      16       74       19       90        6      48        **
** 9/17/81    845   7000.0     6.2      9.0      16       74       19       90        6      48        **
** 9/17/81    900   7000.0     6.1      9.1      16       75       19       90        6      49        **
** 9/17/81    915   7000.0     6.1      9.1      16       75       19       90        6      49        **
** 9/17/81    930   7000.0     5.8      9.3      15       77       17       91        5      49        **
** 9/17/81    945   7000.0     6.0      9.2      15       75       18       90        5      48        **
** 9/17/81   1000   7000.0     5.8      9.4      15       75       17       88        5      48        **
** 9/17/81   1015   7000.0     6.0      9.3      15       74       18       88        5      48        **
** 9/17/81   1030   7000.0     6.0      9.2      15       73       18       87        5      47        **
** 9/17/81   1045   7000.0     6.2      9.1      15       75       18       91        6      49        **
** 9/17/81   1100   7000.0     6.2      9.1      14       75       17       91        5      49        **
** 9/17/81   1115   6900.0     6.1      9.1      15       74       18       89        5      48        **
** 9/17/81   1130   6900.0     6.3      8.9      14       74       17       90        5      49        **
** 9/17/81   1145   6900.0     6.0      9.1      14       76       16       91        5      49        **
** 9/17/81   1200   6900.0     6.2      9.0      14       75       17       91        5      49        **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/17/81	1215	6900.0	6.3	8.9	14	75	17	91	5	49	
9/17/81	1230	6900.0	6.2	9.0	14	76	17	92	5	50	
9/17/81	1245	6900.0	6.4	8.9	14	75	17	92	5	50	
9/17/81	1300	6900.0	6.2	9.1	14	75	17	91	5	49	
9/17/81	1315	6900.0	6.2	9.1	13	75	15	91	5	49	
9/17/81	1330	6900.0	6.0	9.2	14	76	16	91	5	49	
9/17/81	1345	6900.0	6.4	8.9	14	75	17	92	5	50	
9/17/81	1400	.0	.0	.0	0	0	0	0	0	0	C
9/17/81	1415	.0	.0	.0	0	0	0	0	0	0	C
9/17/81	1430	6900.0	6.3	8.9	16	76	19	93	6	50	
9/17/81	1445	6700.0	6.3	8.8	16	76	19	93	6	50	
9/17/81	1500	6700.0	6.1	8.9	16	77	19	93	6	50	
9/17/81	1515	6700.0	6.0	9.0	16	77	19	92	6	50	
9/17/81	1530	6700.0	6.2	8.9	16	77	19	93	6	50	
9/17/81	1545	6700.0	6.2	8.8	16	76	19	92	6	50	
9/17/81	1600	6700.0	6.1	8.9	17	77	20	93	6	50	
9/17/81	1615	6700.0	6.4	8.7	17	76	20	93	6	50	
9/17/81	1630	6700.0	6.3	8.8	17	77	20	94	6	51	
9/17/81	1645	6700.0	6.4	8.7	17	77	20	95	6	51	
9/17/81	1700	6700.0	6.4	8.7	17	77	20	95	6	51	
9/17/81	1715	6700.0	6.1	8.8	18	77	21	93	7	50	
9/17/81	1730	6700.0	6.3	8.7	17	77	20	94	6	51	
9/17/81	1745	6700.0	6.2	8.8	17	78	20	94	6	51	
9/17/81	1800	6700.0	6.2	8.8	17	78	20	94	6	51	
9/17/81	1815	6800.0	6.1	8.8	17	77	20	93	6	50	
9/17/81	1830	6800.0	6.2	8.8	17	77	20	93	6	50	
9/17/81	1845	6800.0	6.5	8.6	17	75	21	93	6	50	
9/17/81	1900	6800.0	6.3	8.7	17	77	20	94	6	51	
9/17/81	1915	6800.0	6.2	8.8	17	77	20	93	6	50	
9/17/81	1930	6800.0	6.3	8.7	18	76	22	93	7	50	
9/17/81	1945	6800.0	6.5	8.6	18	74	22	91	7	49	
9/17/81	2000	6800.0	6.7	8.5	18	73	22	92	7	49	
9/17/81	2015	6800.0	6.5	8.6	19	73	23	90	7	49	
9/17/81	2030	6800.0	6.5	8.6	19	72	23	89	7	48	
9/17/81	2045	6800.0	6.7	8.5	18	72	22	90	7	49	
9/17/81	2100	6800.0	6.7	8.5	19	73	23	92	7	49	
9/17/81	2115	6800.0	6.5	8.6	19	75	23	93	7	50	
9/17/81	2130	6800.0	6.5	8.6	19	73	23	90	7	49	
9/17/81	2145	6800.0	6.7	8.5	19	73	23	92	7	49	
9/17/81	2200	6800.0	6.9	8.0	0	76	0	97	0	52	
9/17/81	2215	.0	.0	.0	0	0	0	0	0	0	C
9/17/81	2230	.0	.0	.0	0	0	0	0	0	0	C
9/17/81	2245	6800.0	6.7	7.7	3	67	3	84	1	45	
9/17/81	2300	6800.0	6.9	7.5	3	66	3	84	1	45	
9/17/81	2315	6800.0	6.7	7.7	3	66	3	83	1	45	
9/17/81	2330	6800.0	6.9	7.5	3	66	3	84	1	45	
9/17/81	2345	6800.0	6.7	7.7	3	67	3	84	1	45	
9/17/81	2400	6800.0	6.9	7.5	3	66	3	84	1	45	

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**                        PETROLEUM PROCESS HEATER, LOW NOX BURNERS                           **
**                                       15 MIN. DATA                                         **
**                                DRY STACK GAS CONCENTRATION                                 **
**                                 O2      CO2       CO       NO       CO       NO       CO       NO  ACODE  **
**                        LOAD   VOL%     VOL%     PPMV     PPMV     PPMV     PPMV     NG/J     NG/J         **
**    DATE    TIME         B/D   MEAS     MEAS     MEAS     MEAS     3%O2     3%O2                           **
************************************************************************************************
** 9/18/81      15      6900.0    6.8      7.6        3       66        3       83        1       45         **
** 9/18/81      30      6900.0    6.9      7.5        3       66        3       84        1       45         **
** 9/18/81      45      6900.0    7.0      7.5        3       65        3       83        1       45         **
** 9/18/81     100      6900.0    7.0      7.4        3       65        3       83        1       45         **
** 9/18/81     115      6900.0    6.9      7.6        3       66        3       84        1       45         **
** 9/18/81     130      6900.0    6.9      7.6        3       66        3       84        1       45         **
** 9/18/81     145      6900.0    6.9      7.5        3       66        3       84        1       45         **
** 9/18/81     200      6900.0    6.8      7.6        3       66        3       83        1       45         **
** 9/18/81     215      6900.0    6.9      7.6        3       66        3       84        1       45         **
** 9/18/81     230      6900.0    7.3      7.2        3       63        3       82        1       44         **
** 9/18/81     245      6900.0    7.0      7.4        3       64        3       82        1       44         **
** 9/18/81     300      6900.0    7.1      7.4        3       63        3       81        1       44         **
** 9/18/81     315      6900.0    7.0      7.4        3       64        3       82        1       44         **
** 9/18/81     330      6900.0    7.0      7.4        3       63        3       81        1       44         **
** 9/18/81     345      6900.0    7.3      7.3        3       62        3       81        1       44         **
** 9/18/81     400      6900.0    7.0      7.4        3       64        3       82        1       44         **
** 9/18/81     415      6900.0    7.0      7.5        3       64        3       82        1       44         **
** 9/18/81     430      6900.0    7.3      7.2        2       62        2       81        0       44         **
** 9/18/81     445      6900.0    7.2      7.4        2       64        2       83        0       45         **
** 9/18/81     500      6900.0    7.1      7.4        2       64        2       83        0       45         **
** 9/18/81     515      6900.0    7.0      7.4        3       64        3       82        1       44         **
** 9/18/81     530      6900.0    7.1      7.4        2       64        2       83        0       45         **
** 9/18/81     545      6900.0    7.1      7.4        2       64        2       83        0       45         **
** 9/18/81     600      6900.0    7.0      6.7        5       64        6       82        2       44         **
** 9/18/81     615      6800.0    6.9      5.7        0       63        0       80        0       43         **
** 9/18/81     630      6800.0    7.0      5.7        1       63        1       81        0       44         **
** 9/18/81     645      6800.0    7.2      5.7        1       62        1       81        0       43         **
** 9/18/81     700      6800.0    6.9      5.8        0       63        0       80        0       43         **
** 9/18/81     715      6800.0    7.1      5.7        0       62        0       80        0       43         **
** 9/18/81     730      6800.0    7.0      5.8        1       63        1       81        0       44         **
** 9/18/81     745      6800.0    6.9      5.8        0       64        0       81        0       44         **
** 9/18/81     800      6800.0    6.7      6.0        0       65        0       81        0       44         **
** 9/18/81     815      6800.0    6.7      6.0        0       63        0       79        0       43         **
** 9/18/81     830      6800.0    6.5      6.0        0       63        0       78        0       42         **
** 9/18/81     845      6800.0    6.9      5.8        0       61        0       77        0       42         **
** 9/18/81     900      6800.0    6.7      5.9        0       62        0       78        0       42         **
** 9/18/81     915      6800.0    7.1      5.7        0       61        0       79        0       42         **
** 9/18/81     930      6800.0    7.0      5.8        0       62        0       79        0       43         **
** 9/18/81     945      6800.0    7.0      5.8        0       63        0       81        0       44         **
** 9/18/81    1000      6800.0    6.8      5.9        0       64        0       81        0       44         **
** 9/18/81    1015          .0     .0       .0        0        0        0        0        0        0   C     **
** 9/18/81    1030          .0     .0       .0        0        0        0        0        0        0   C     **
** 9/18/81    1045      6800.0    6.9      9.5       16       72       20       92        6       49         **
** 9/18/81    1100      6800.0    6.9      9.5       16       72       20       92        6       49         **
** 9/18/81    1115      6800.0    6.9      9.4       16       72       20       92        6       49         **
** 9/18/81    1130      6800.0    6.9      9.5       15       72       19       92        6       49         **
** 9/18/81    1145      6800.0    7.3      9.1       15       68       19       89        6       48         **
** 9/18/81    1200      6800.0    7.4      9.1       15       69       19       91        6       49         **
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PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/18/81	1215	6800.0	7.6	8.9	14	72	18	96	6	52	
9/18/81	1230	6800.0	8.0	8.7	14	70	19	97	6	52	
9/18/81	1245	6800.0	7.9	8.8	14	70	19	96	6	52	
9/18/81	1300	6800.0	7.1	9.4	14	75	18	97	5	52	
9/18/81	1315	6800.0	7.1	9.3	14	77	18	99	5	54	
9/18/81	1330	6800.0	7.5	9.1	14	72	18	96	6	52	
9/18/81	1345	6800.0	7.3	9.3	13	75	17	98	5	53	
9/18/81	1400	6800.0	5.4	8.1	9	76	10	87	3	47	
9/18/81	1415	6800.0	7.8	8.1	17	74	22	98	7	53	
9/18/81	1430	6800.0	7.1	8.3	20	70	25	90	8	49	
9/18/81	1445	6800.0	7.2	8.2	17	72	22	94	7	51	
9/18/81	1500	6800.0	7.2	8.2	18	73	23	95	7	51	
9/18/81	1515	6800.0	6.9	8.4	18	75	23	95	7	52	
9/18/81	1530	6800.0	7.2	8.2	18	73	23	95	7	51	
9/18/81	1545	6800.0	6.9	8.4	18	72	23	92	7	49	
9/18/81	1600	6800.0	6.9	8.4	18	73	23	93	7	50	
9/18/81	1615	6800.0	7.1	8.2	18	71	23	92	7	49	
9/18/81	1630	6800.0	6.6	8.5	19	74	23	92	7	50	
9/18/81	1645	6800.0	7.2	8.1	19	72	24	94	8	51	
9/18/81	1700	6800.0	6.9	8.3	19	73	24	93	7	50	
9/18/81	1715	6800.0	7.1	8.2	19	73	24	94	8	51	
9/18/81	1730	6800.0	7.1	8.2	19	73	24	94	8	51	
9/18/81	1745	6800.0	6.9	8.4	19	74	24	94	7	51	
9/18/81	1800	6800.0	6.9	8.3	19	73	24	93	7	50	
9/18/81	1815	6900.0	6.9	8.4	19	72	24	92	7	49	
9/18/81	1830	6900.0	6.9	8.4	19	73	24	93	7	50	
9/18/81	1845	6900.0	6.9	8.3	20	71	25	90	8	49	
9/18/81	1900	.0	6.7	8.4	20	73	25	92	8	49	
9/18/81	1915	6900.0	.0	.0	0	0	0	0	0	0	K
9/18/81	1930	6900.0	7.0	8.2	20	69	25	88	8	48	
9/18/81	1945	6900.0	6.2	8.7	21	70	25	85	8	46	
9/18/81	2000	6900.0	6.7	8.4	21	68	26	85	8	46	
9/18/81	2015	.0	.0	.0	0	0	0	0	0	0	K
9/18/81	2030	.0	.0	.0	0	0	0	0	0	0	K
9/18/81	2045	6900.0	6.7	8.4	22	72	27	90	9	49	
9/18/81	2100	6900.0	6.9	8.3	22	70	28	89	9	48	
9/18/81	2115	6900.0	6.5	8.6	22	73	27	90	9	49	
9/18/81	2130	6900.0	6.7	8.5	22	73	27	92	9	49	
9/18/81	2145	6900.0	6.8	8.4	21	71	26	90	8	48	
9/18/81	2200	6900.0	5.6	8.2	22	73	25	85	8	46	
9/18/81	2215	6900.0	6.3	8.7	18	69	22	84	7	45	
9/18/81	2230	6900.0	6.8	8.4	17	68	21	86	7	46	
9/18/81	2245	6900.0	6.7	8.6	17	70	21	88	7	47	
9/18/81	2300	6900.0	6.9	8.4	16	69	20	88	6	47	
9/18/81	2315	6900.0	6.9	8.4	17	69	21	88	7	47	
9/18/81	2330	6900.0	6.2	8.9	18	73	21	88	7	48	
9/18/81	2345	6900.0	6.8	8.4	17	69	21	87	7	47	
9/18/81	2400	6900.0	7.2	8.2	17	67	22	87	7	47	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/19/81	15	6900.0	6.8	8.5	17	69	21	87	7	47	
9/19/81	30	6900.0	6.9	8.4	17	69	21	88	7	47	
9/19/81	45	6900.0	7.5	7.9	16	66	21	88	7	47	
9/19/81	100	6900.0	6.8	8.5	16	69	20	87	6	47	
9/19/81	115	6900.0	6.7	8.6	15	70	18	88	6	47	
9/19/81	130	6900.0	5.5	9.4	16	75	18	87	6	47	
9/19/81	145	6900.0	7.1	8.3	15	68	19	88	6	47	
9/19/81	200	6900.0	6.7	8.6	15	71	18	89	6	48	
9/19/81	215	6900.0	7.0	8.4	15	70	19	90	6	48	
9/19/81	230	6900.0	6.7	8.6	15	72	18	90	6	49	
9/19/81	245	6900.0	6.7	8.6	14	73	17	92	5	49	
9/19/81	300	6900.0	6.5	8.6	14	75	17	93	5	50	
9/19/81	315	6900.0	6.6	8.6	14	73	17	91	5	49	
9/19/81	330	6900.0	6.6	8.6	13	72	16	90	5	48	
9/19/81	345	6900.0	6.3	8.9	14	77	17	94	5	51	
9/19/81	400	6900.0	6.7	8.6	13	76	16	95	5	51	
9/19/81	415	6900.0	6.7	8.6	13	75	16	94	5	51	
9/19/81	430	6900.0	6.8	8.6	13	74	16	93	5	50	
9/19/81	445	6900.0	6.8	8.5	13	75	16	95	5	51	
9/19/81	500	6900.0	6.7	8.6	13	76	16	95	5	51	
9/19/81	515	6900.0	6.9	8.5	13	75	16	95	5	52	
9/19/81	530	6900.0	6.5	8.7	13	76	16	94	5	51	
9/19/81	545	6900.0	6.6	8.7	12	75	15	93	4	50	
9/19/81	600	6900.0	6.5	8.7	13	75	16	93	5	50	
9/19/81	615	6900.0	6.6	8.7	13	75	16	93	5	50	
9/19/81	630	6900.0	6.4	8.8	13	74	16	91	5	49	
9/19/81	645	.0	.0	.0	0	0	0	0	0	0	C
9/19/81	700	6900.0	6.6	8.5	18	76	22	95	7	51	
9/19/81	715	6900.0	6.5	8.7	17	79	21	98	6	53	
9/19/81	730	6900.0	6.7	8.5	17	80	21	100	7	54	
9/19/81	745	6900.0	6.4	8.7	13	80	16	98	5	53	
9/19/81	800	6900.0	6.4	8.7	17	79	20	97	6	52	
9/19/81	815	6900.0	6.7	8.5	16	76	20	95	6	51	
9/19/81	830	6900.0	6.4	8.7	17	77	20	95	6	51	
9/19/81	845	6900.0	6.6	8.5	17	74	21	92	7	50	
9/19/81	900	6900.0	6.3	8.7	17	74	20	90	6	49	
9/19/81	915	6900.0	6.6	8.5	17	72	21	90	7	48	
9/19/81	930	6900.0	6.4	8.7	18	74	22	91	7	49	
9/19/81	945	6900.0	6.5	8.5	18	72	22	89	7	48	
9/19/81	1000	6900.0	6.3	8.7	19	72	23	88	7	47	
9/19/81	1015	6900.0	6.5	8.5	19	73	23	90	7	49	
9/19/81	1030	6900.0	6.4	8.6	19	75	23	92	7	50	
9/19/81	1045	6900.0	6.3	8.7	20	75	24	91	8	49	
9/19/81	1100	6900.0	6.7	8.4	19	73	23	92	7	49	
9/19/81	1115	6900.0	6.4	8.7	20	74	24	91	8	49	
9/19/81	1130	6900.0	6.3	8.6	20	72	24	88	8	47	
9/19/81	1145	6900.0	6.4	8.6	21	71	25	87	8	47	
9/19/81	1200	6900.0	6.6	8.4	20	70	25	87	8	47	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS
15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/19/81	1215	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	1230	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	1245	6900.0	6.9	8.3	21	69	26	88	8	47	
9/19/81	1300	6900.0	6.2	8.8	22	72	26	87	8	47	
9/19/81	1315	6900.0	6.4	8.6	22	71	27	87	8	47	
9/19/81	1330	6900.0	6.7	8.4	21	69	26	86	8	47	
9/19/81	1345	6900.0	6.4	8.7	22	71	27	87	8	47	
9/19/81	1400	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	1415	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	1430	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	1445	6900.0	5.6	8.4	20	73	23	85	7	46	
9/19/81	1500	6900.0	6.4	8.7	17	68	20	83	6	45	
9/19/81	1515	6900.0	6.7	8.4	17	67	21	84	7	45	
9/19/81	1530	7000.0	6.5	8.6	17	69	21	85	6	46	
9/19/81	1545	7000.0	6.5	8.6	17	67	21	83	6	45	
9/19/81	1600	7000.0	7.0	8.3	17	65	21	83	7	45	
9/19/81	1615	7000.0	6.3	8.8	18	69	22	84	7	45	
9/19/81	1630	7000.0	6.8	8.4	17	65	21	82	7	44	
9/19/81	1645	7000.0	6.6	8.6	17	69	21	86	7	46	
9/19/81	1700	7000.0	6.6	8.5	17	69	21	86	7	46	
9/19/81	1715	7000.0	6.9	8.4	17	66	21	84	7	45	
9/19/81	1730	7000.0	6.9	8.3	17	66	21	84	7	45	
9/19/81	1745	7000.0	6.9	8.4	17	70	21	89	7	48	
9/19/81	1800	7000.0	7.1	8.5	16	70	20	90	6	49	
9/19/81	1815	7000.0	6.8	8.6	17	71	21	90	7	48	
9/19/81	1830	7000.0	6.8	8.7	17	72	21	91	7	49	
9/19/81	1845	7000.0	6.8	8.7	16	72	20	91	6	49	
9/19/81	1900	7000.0	6.8	8.7	17	71	21	90	7	48	
9/19/81	1915	7000.0	6.7	8.8	17	73	21	92	7	49	
9/19/81	1930	7000.0	7.0	8.6	17	71	21	91	7	49	
9/19/81	1945	7000.0	7.0	8.6	17	71	21	91	7	49	
9/19/81	2000	7000.0	6.9	8.6	17	70	21	89	7	48	
9/19/81	2015	7000.0	7.3	8.3	17	67	22	88	7	47	
9/19/81	2030	7000.0	6.6	8.8	18	70	22	87	7	47	
9/19/81	2045	7000.0	6.9	8.6	17	69	21	88	7	47	
9/19/81	2100	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	2115	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	2130	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	2145	.0	.0	.0	0	0	0	0	0	0	K
9/19/81	2200	7000.0	6.5	8.9	17	70	21	87	6	47	
9/19/81	2215	7000.0	6.8	8.7	17	70	21	88	7	48	
9/19/81	2230	.0	.0	.0	0	0	0	0	0	0	C
9/19/81	2245	7000.0	6.5	8.7	18	77	22	95	7	51	
9/19/81	2300	7000.0	6.7	8.8	17	70	21	88	7	47	
9/19/81	2315	7000.0	6.9	8.6	17	69	21	88	7	47	
9/19/81	2330	7000.0	6.9	8.6	17	69	21	88	7	47	
9/19/81	2345	7000.0	6.8	8.7	17	69	21	87	7	47	
9/19/81	2400	7000.0	7.0	8.6	16	69	20	88	6	48	

PETROLEUM PROCESS HEATER, LOW NOX BURNERS

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD B/D	O2 VOL% MEAS	CO2 VOL% MEAS	CO PPMV MEAS	NO PPMV MEAS	CO PPMV 3%O2	NO PPMV 3%O2	CO NG/J	NO NG/J	ACODE
9/20/81	15	7000.0	7.2	8.4	16	68	20	88	6	48	
9/20/81	30	7000.0	7.6	8.2	15	67	20	90	6	48	
9/20/81	45	7000.0	7.8	8.0	15	66	20	90	6	48	
9/20/81	100	7000.0	7.3	8.3	15	68	19	89	6	48	
9/20/81	115	7000.0	6.6	8.6	15	68	18	85	6	46	
9/20/81	130	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	145	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	200	7000.0	7.7	7.7	14	64	18	86	6	47	C
9/20/81	215	7000.0	6.9	8.4	14	67	17	85	5	46	
9/20/81	230	7000.0	7.2	8.2	15	66	19	86	6	46	
9/20/81	245	7000.0	6.9	6.4	14	69	17	88	5	47	
9/20/81	300	7000.0	6.7	8.6	14	69	17	86	5	47	
9/20/81	315	7000.0	6.6	8.7	15	69	18	86	6	46	
9/20/81	330	7000.0	6.7	8.6	14	70	17	88	5	47	
9/20/81	345	7000.0	6.7	8.5	14	69	17	86	5	47	
9/20/81	400	7000.0	6.7	8.6	14	69	17	86	5	47	
9/20/81	415	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	430	7000.0	6.8	8.5	14	69	17	87	5	47	
9/20/81	445	7000.0	6.9	8.4	15	71	19	90	6	49	
9/20/81	500	7000.0	6.7	8.6	14	73	17	92	5	49	
9/20/81	515	7000.0	6.6	8.6	14	73	17	91	5	49	
9/20/81	530	7000.0	6.6	8.6	14	72	17	90	5	48	
9/20/81	545	7000.0	6.6	8.6	14	74	17	92	5	50	
9/20/81	600	7000.0	6.3	8.8	14	73	17	89	5	48	
9/20/81	615	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	630	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	645	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	700	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	715	.0	.0	.0	0	0	0	0	0	0	K
9/20/81	730	7000.0	6.7	8.6	17	73	21	92	7	49	
9/20/81	745	7000.0	6.7	8.6	17	73	21	92	7	49	
9/20/81	800	7000.0	6.7	8.6	17	72	21	90	7	49	
9/20/81	815	7000.0	6.6	8.6	17	73	21	91	7	49	
9/20/81	830	7000.0	6.7	8.5	17	72	21	90	7	49	
9/20/81	845	7000.0	6.5	8.6	17	71	21	88	6	47	
9/20/81	900	7000.0	6.8	8.4	23	63	29	79	9	43	
9/20/81	915	7000.0	6.6	8.6	20	66	25	82	8	44	
9/20/81	930	7000.0	6.4	8.7	18	69	22	85	7	46	
9/20/81	945	7000.0	6.5	8.6	18	66	22	82	7	44	
9/20/81	1000	7000.0	6.5	8.6	17	64	21	79	6	43	
9/20/81	1015	7000.0	6.3	8.8	18	68	22	83	7	45	
9/20/81	1030	7000.0	6.4	8.7	18	68	22	83	7	45	
9/20/81	1045	7000.0	4.0	10.5	19	74	20	78	6	42	
9/20/81	1100	7000.0	3.9	10.5	21	75	22	78	7	42	
9/20/81	1115	7000.0	7.0	8.3	19	63	24	81	8	44	
9/20/81	1130	7000.0	7.9	7.7	19	60	26	82	8	44	
9/20/81	1145	7000.0	6.7	8.5	19	65	23	81	7	44	
9/20/81	1200	7000.0	5.5	9.3	21	70	24	81	8	44	

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****************************************************************************************
**                  PETROLEUM PROCESS HEATER, LOW NOX BURNERS                          **
**                                15 MIN. DATA                                         **
**                         DRY STACK GAS CONCENTRATION                                 **
**                              O2     CO2     CO     NO     CO     NO     CO     NO  ACODE **
**                      LOAD   VOL%   VOL%   PPMV   PPMV   PPMV   PPMV   NG/J   NG/J      **
**    DATE     TIME      B/D   MEAS   MEAS   MEAS   MEAS   3%O2   3%O2                    **
****************************************************************************************
** 9/20/81    1215        .0     .0     .0      0      0      0      0      0      0  C   **
** 9/20/81    1230    7000.0    5.7    9.2     21     71     24     83      8     45      **
** 9/20/81    1245    7000.0    5.7    9.2     21     73     24     85      8     46      **
** 9/20/81    1300    7000.0    5.8    9.0     21     72     24     85      8     46      **
** 9/20/81    1315    7000.0    6.2    8.8     22     69     26     84      8     45      **
** 9/20/81    1330    7000.0    6.1    8.9     22     72     26     87      8     47      **
** 9/20/81    1345    7000.0    6.1    8.9     22     72     26     87      8     47      **
** 9/20/81    1400    7000.0    5.8    9.1     22     73     26     86      8     46      **
** 9/20/81    1415    7000.0    5.9    9.0     22     73     26     87      8     47      **
** 9/20/81    1430    7000.0    5.5    8.6     22     69     25     80      8     43      **
** 9/20/81    1445    7000.0    5.2    9.1     20     78     22     88      7     48      **
** 9/20/81    1500    7000.0    6.0    8.9     16     71     19     85      6     46      **
** 9/20/81    1515    7000.0    5.8    9.0     17     72     20     85      6     46      **
** 9/20/81    1530    7000.0    6.1    8.8     17     70     20     84      6     45      **
** 9/20/81    1545    7000.0    6.3    8.7     16     68     19     83      6     45      **
** 9/20/81    1600    7000.0    5.9    9.0     17     70     20     83      6     45      **
** 9/20/81    1615    7000.0    6.0    8.9     17     71     20     85      6     46      **
** 9/20/81    1630    7000.0    6.4    8.6     16     70     19     86      6     46      **
** 9/20/81    1645    7000.0    5.9    8.9     16     70     19     83      6     45      **
** 9/20/81    1700    7000.0    6.2    8.8     16     68     19     82      6     44      **
** 9/20/81    1715    7000.0    6.1    8.8     15     69     18     83      5     45      **
** 9/20/81    1730    7000.0    6.2    8.8     15     70     18     85      6     46      **
** 9/20/81    1745    7000.0    6.3    8.8     15     70     18     85      6     46      **
** 9/20/81    1800    7000.0    6.1    8.9     15     70     18     84      5     45      **
** 9/20/81    1815    7000.0    6.3    8.7     15     69     18     84      6     45  B   **
** 9/20/81    1830        .0     .0     .0      0      0      0      0      0      0  B   **
** 9/20/81    1845        .0     .0     .0      0      0      0      0      0      0  B   **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
** 0/ 0/ 0       0        .0     .0     .0      0      0      0      0      0      0      **
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         DESCRIPTIVE STATISTICS
         STANDARD     MEAN     HOURLY        MAX.        MIN.      RANGE
         DEVIATION  DEVIATION  MEAN
NO          24.69     -7.11     71.28       96.25        1.25      95.00
O2           2.61      -.64      5.85       13.82        1.72      12.10
CO2          2.97      -.88      8.60       11.97        2.67       9.30
CO          27.65     -1.84     13.63      504.75        1.00     503.75
```